SCIENTIFIC AMERICAN

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SEA-GOING TORPEDO BOAT NO. 1, UNITED STATES NAVY.

BY LIEUTENANT F. J. DRAKE, U.S.N.

The first sea-going torpedo boat constructed for the United States navy was launched from the yard of the Herreshoff Manufacturing Company, at Bristol, R. I., on January 23. A description of the material of which the hull and machinery are composed, and a general outline of the internal fittings and armament, will give the public at large some idea of the requirements which surround the building of a modern sea-going torpedo boat having the highest possible speed.

The specifications for building this boat were issued by the Bureau of Ordnance, under whose able direction the present torpedo system of our navy was inaugurated and is now being developed into an arm of our coast defense fully adequate to the demands of the new navy.

The accompanying plate shows plan and longitudinal sectional view of hull, and transverse sections at five different points, giving the location of water-tight compartments, boilers, engines, auxiliaries, ejectors, dynamos, launching tubes, and other fittings to be described.

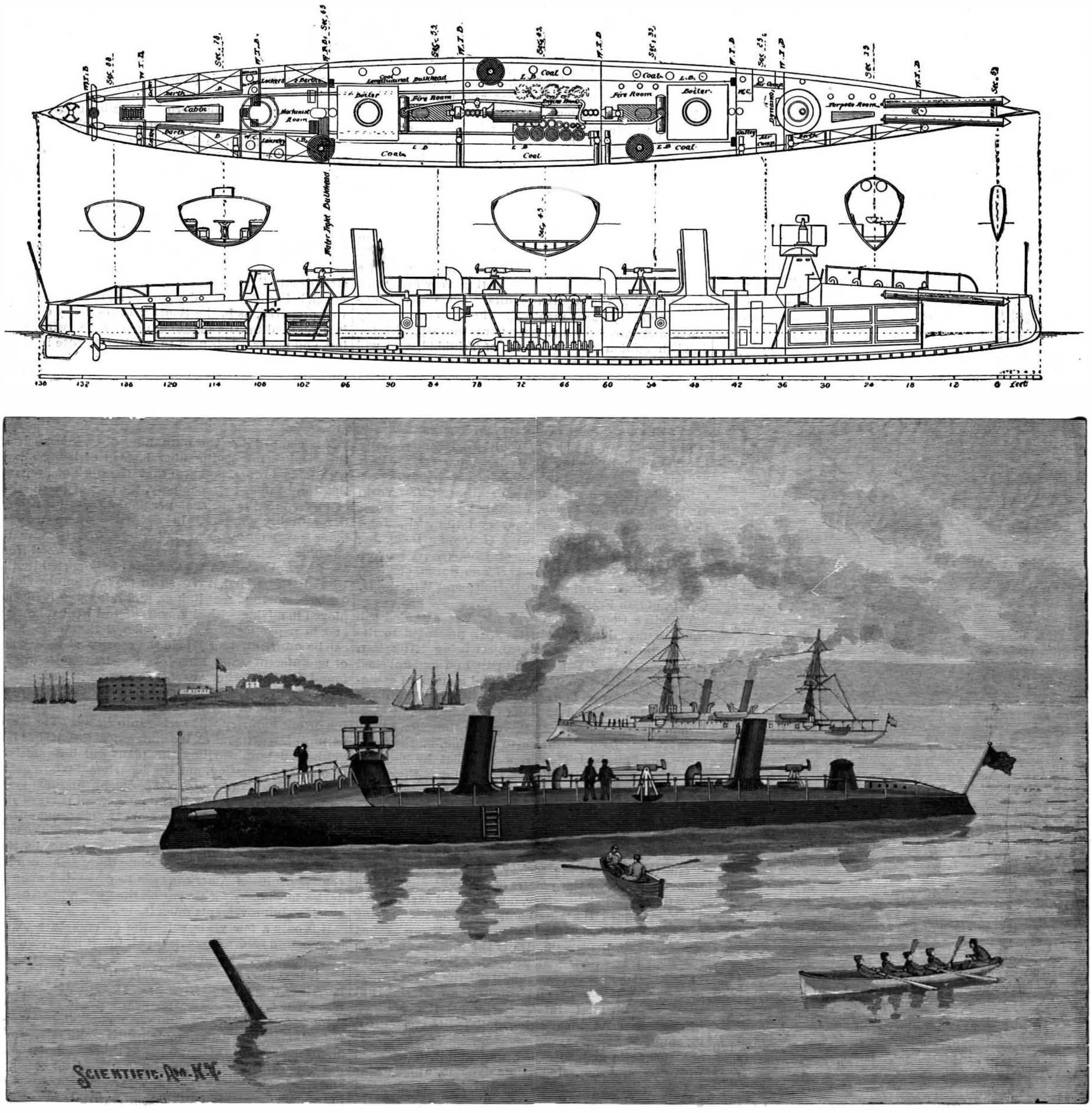
All material entering into the construction of the hull and machinery was subjected to the standard government tests. The frames, shell plating, and all bulkheads are composed of galvanized steel.

Some important data have been obtained relative to the effect produced upon plates and frames of ten pounds per square foot and under, from galvanizing, the record of which will be published later in the SCIENTIFIC AMERICAN SUPPLEMENT.

The following are the principal dimensions of the boat:

Length between perpendiculars	137·5 feet.
Breadth at L. W. plane (moulded)	14·10 "
Breadth extreme	15·05 "
Depth of hold	9·21 "
Draught (ordinary)	4·50 "
Displacement in tons (2,240 pounds)	91·34 "
Tons per inch immersion at L. W. P.	3·02 "
Moment to alter trim one inch at L. W. P.	18·81 foot tons.
Area of midship section	42·36 square feet.
Area of L. W. P.	1297·89 "
Center of gravity of L. W. P. abaft Section 45.	4·94 feet.
Section 45, abaft forward perpendicular or stem	67·5 "

(*Continued on page 71.*)



THE CUSHING—SEA-GOING TORPEDO BOAT No. 1, UNITED STATES NAVY.

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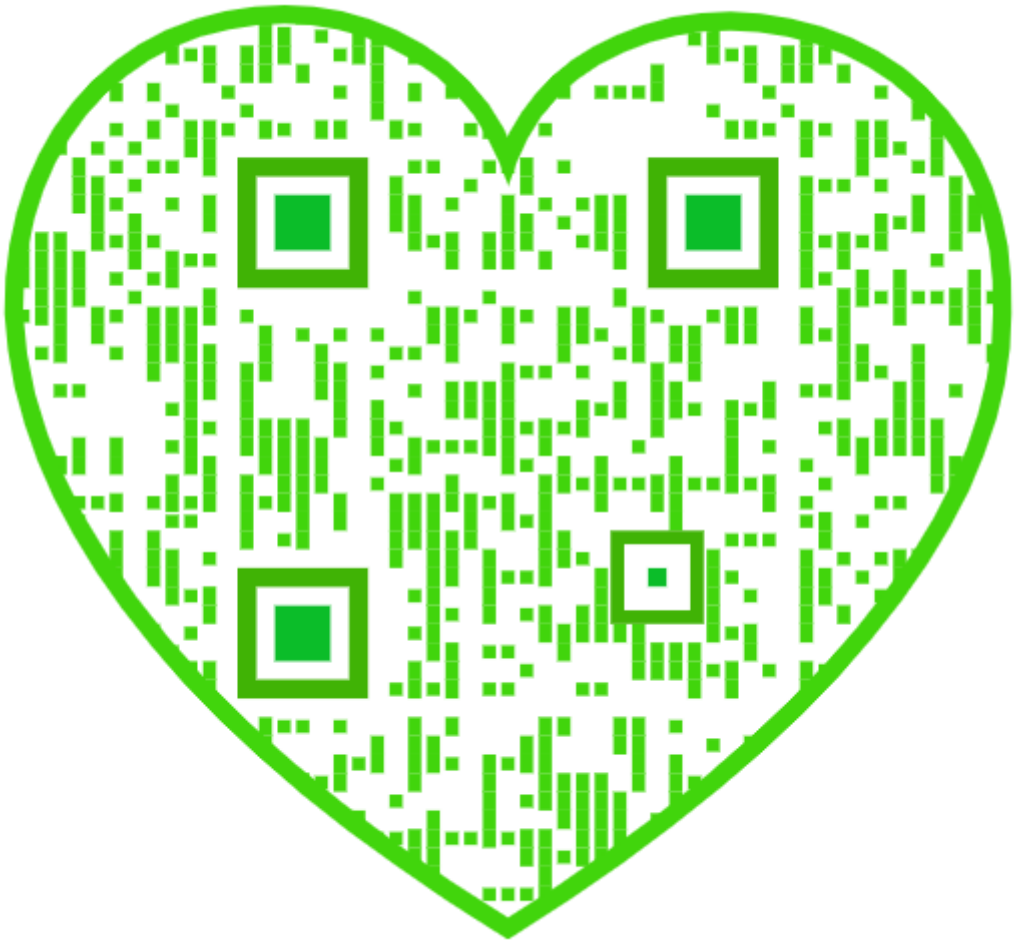

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THE HUDSON RIVER TUNNEL.

Work upon the tunnel under the Hudson River, connecting Jersey City and New York City, has been slowly progressing, but in the course of a few weeks is to take a new phase. The English syndicate who have taken up the enterprise have contracted with Messrs. Pearson & Son for the completion of the enterprise. They are to begin work very soon, and are pledged to complete it within about a year. Mr. Wm. R. Hutton, the well-known engineer of this city, is to be resident engineer. His name is already familiar to our readers in connection with the Washington Bridge, of which he was chief engineer. The north tunnel already extends well toward the center of the river from the Jersey shore, and it is proposed to start a lateral connection therefrom to the line of the south tunnel, in order to work both east and west from its center. This would give, in connection with the shore ends, four separate working faces.

THE TOTAL ECLIPSE OF DECEMBER 22, 1889.

Professors S. M. Burnham and J. M. Schaeberle, representing the Lick Observatory, have just returned from Cayenne, French Guiana, whither they had gone to make observations of the total eclipse of the sun. It will be recollected by our readers that the path of totality followed a line that extended across the African continent and the Southern Atlantic Ocean, touching on its western extremity Guiana and some of the West India islands. The African parties established near the west coast had very fair success, but were troubled by bad weather. The Lick Observatory expedition reports that in South America they were also victims of the weather. Reaching Cayenne December 3, they experienced bad weather continuously. Within half an hour of totality it rained hard, and there were two showers between the first contact and the commencement of totality. About twelve good negatives were secured, which were developed within two or three days of the eclipse. The times of exposure were varied in order to insure good results. The corona is reported as varying in elongation at the sun's equator and poles, and as showing in places a curved structure. An interesting commentary on the role now played in astronomy by photography is contained in the fact that no systematic visual observations were made, The entire energies of the party were devoted to securing good negatives. The period of totality lasted only one minute and forty-three seconds, necessitating very fast work to accomplish the desired results. The observations at Cayenne represent practically the extreme westerly observations, comparing, as regards locality, with the English station on the island of Trinidad, and will have a special interest when compared with those made on the other side of the Atlantic Ocean near the African coast.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

The American Society of Civil Engineers recently held its annual meeting at its headquarters, 127 East 23d Street, and elected the following officers for the ensuing year: President, William P. Shinn, of New York; vice-presidents, A. Fteley, of New York, and Mendes Cohn, of Baltimore; secretary and librarian, John Bogart, of New York; treasurer, George S. Green, Jr.; directors, Charles B. Brush, of Hoboken; Theodore Voorhees, of New York; Robert Van Buren, of Newburg; William Ludlow, of Detroit; and William G. Curtis, of San Francisco.

Theodore Cooper, of New York, was awarded the Norman medal for the best paper presented to the society during the year, the subject being "American Railway Bridges." For the best paper on accomplished works of construction, their cost and manner of execution, and the errors in design and execution, a prize of $50 cash was awarded to James D. Schuyler, of California, his paper being on "The Continuation of the Surge Water Dam." Chairman Fleming, of the Committee on Standard Time, reported that he had sent circulars to 387 railroad officials, asking if they were in favor of standard time. Only seventeen replies in the negative were received. The majority were in favor of asking Congress to make the change in 1890. The meeting resolved to ask Congress to adopt the new system.

The members of the society visited Willets Point, being received by the officers of the post and shown over the torpedo laboratory, museum and earthworks. They examined the automobile torpedo, the drifting torpedo, and the electrical buoy, which, if run against while lying in the stream, draws the fire of a gun from the ramparts, with equal precision whether by night or day. The museum has models of the newest coast defense designs, guns, and submarine batteries, but what proved most interesting were the pontoon bridges, some of them being declared to be of great ingenuity.

A magnetic gun, so called, was exhibited, wrapped with wire, and connected with a dynamo, which draws a ball weighing 300 pounds, and lying some five feet distant, into its mouth by attraction. Spikes thrown at the gun stood out like bristles, and an iron wheelbarrow once in contact, the strength of a man was not sufficient to pull it away. This great magnet was illustrated several months ago in the SCIENTIFIC AMERICAN. As the party were leaving, a submerged charge of 100 pounds of dynamite was exploded under an old sloop, blowing it into small fragments and sending a great column of spray upward. Another charge of fifty pounds was exploded under a buoy, the idea being to illustrate a hostile boat's crew trying to remove torpedoes from a channelway at night to make the way clear for a marauding fleet.

Steaming down to the navy yard, the work on the new steel cruiser Maine and cruiser No. 7, now building, was inspected. Thence the party went through the shops and the new wooden drydock.

OKRA.

There seems to be a strong probability that the plant known as okra (*Abelmoschus esculentus*) will be made to furnish a valuable fiber. The plant grows wild all through the Southern States, and has been known for years to farmers and stock men as capable of producing a very strong fiber, which in Texas and other localities is now used in making lariats.

Ten years ago the Department of Agriculture had samples of the plant grown in its greenhouses, and a report was made on the quality of the fiber, but nothing seems to have come of it. Recently, however, the subject has been revived, and the Commissioner of Agriculture of South Carolina, Mr. A. P. Butler, seems to be very confident that a new industry with vast possibilities is about to be opened up. A specimen of the fiber which has been received from Mr. Butler through the department at Washington shows a long, strong, and glossy thread somewhat resembling hemp, though darker in color. The fruit which this okra plant produces is prized as a vegetable, the mucilaginous pods being used for thickening soup and to form a peculiar Southern dish called gumbo. The Southern soil is especially adapted to growing the plant, as the abandoned rice fields and undrained lands generally could be utilized for raising vast quantities of it. Okra is also a native of the West Indies, notably Cuba, where it grows in almost all soils, and is indigenous to Africa, where it grows wild. It is abundant on the White Nile and near the Victoria Nyanza, and has long been naturalized in India, where it is cultivated for its edible pods. The fiber which has been produced abroad is described as long and silky and generally strong and pliant, its breaking strain according to Roxburgh being 79 pounds dry and 95 pounds wet. When well prepared, as in the Southern Presidency of India, it is adapted for the manufacture of rope, twine, sacking, and paper. It is used to adulterate jute in Decca and Mymensing. In France the manufacture of paper from the fiber is patented, and here it receives only mechanical treatment and produces a paper called banda, which is said to be equal to that made from pure rags.

It is claimed for the okra fiber that, inasmuch as the wood surrounds the fiber instead of being mixed with it, as in jute, and also that the work of preparation can be done by machinery, the cost of production can be reduced to one cent per pound. Jute can only be profitably produced in countries where manual labor is very cheap, as in India and China, because no machine has been devised for separating the wood from the fiber. Vast quantities of jute are imported by the United States, and it is used in making gunny cloth, cordage, shirting, coat linings, and it is extensively employed in mixing with silk, cotton, and woolen fabrics, and in paper making. It is believed that okra fiber can be substituted for jute in the coarser of these lines of manufacture, and some even claim that it will be found available wherever jute is now employed.

It is easily to be seen from this that if the okra fiber stands the test of further experiment, a new and most important industry will spring into being. The Agricultural Department at Washington states it has not yet been determined how the plant will bear cultivation and propagation, and the department is now gathering the seeds and roots to experiment with next year. As the okra now grows luxuriantly in all parts of the South, the production of it even in the large quantities which would be required in case the fiber comes into general use will not probably prove a serious barrier to progress in this direction, while the well known inventive genius of Americans can be depended upon to devise machinery for preparing the fiber and to make constant improvements upon it.

It is only a few years since the manufacture of oil from cotton seed was commenced, but it has become a great industry. From September 1, 1883, to September 1, 1886, there were exported from New York 88,871 barrels of this oil, and from New Orleans 186,720 barrels. The first recorded attempt to extract the oil was made in Virginia in 1826, and was successful, but it was not commercially experimented with until 1834, when an attempt to manufacture it was made in Louisiana, but did not prove to be profitable. A second attempt and a second failure was made in 1847. During succeeding years new and important improvements were made in the machinery for extracting the oil, and in 1882 the business had become profitable. During previous

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years cotton seed had been left to rot at the gins, or, at best, only occasionally used as a fertilizer. The oil is the most valuable part of the seed, and is used for mixing with lard, in soap making, dressing morocco, softening wool, as well as in pharmacy. The cake which is left after extracting the oil is fed to cattle, and the meal, another element of the residue, is used to enrich the land, and it has been found that for food, and as a fertilizer, these component parts of the cotton seed are more serviceable than was the seed when used whole. Such are the leading characteristics of a great industry which has been built up during the past few years by utilizing the once despised cotton seed, and it may not be too much to expect, in view of these facts, that the okra weed may be made to furnish a fiber which will enter into a great variety of manufactures, and thus become still another element in the diversification of American industries.

POSITION OF THE PLANETS FOR FEBRUARY.

SATURN

is morning star until the 18th, and, after that time, evening star. He is by far the most interesting member of the sun's family during the whole month. He reaches his opposition with the sun on the 18th at 11 h. P. M. This is the great epoch in his course, for he is then nearest to the earth, rises at sunset, is on the meridian at midnight, and sets at sunrise. He is a beautiful object as he approaches opposition in the first part of the month and as he recedes from it in the last part of the month. Saturn may be easily found east of Regulus, in the handle of the Sickle, the distance between planet and star constantly lessening, so that when the month closes they are only 2° apart.

Saturn rises on the 1st at 6 h. 41 m. P. M. On the 28th he sets at 6 h. 17 m. A. M. His diameter on the 1st is 18".8, and he is in the constellation Leo.

MARS

is morning star. An interesting event occurs in his course. He is in quadrature with the sun on the 9th, at 6 h. P. M., and has, therefore, advanced half way on his journey toward the opposition so greatly desired by Martian observers. Mars, as well as Saturn, has a bright star for a companion, and may be found southeast of Spica, shining as a ruddy star, and rising about midnight on the last of the month.

Mars rises on the 1st at 1 h. 4 m. A. M. On the 28th he rises at 0 h. 21 m. A. M. His diameter on the 1st is 7".2, and he is in the constellation Libra.

VENUS

is morning star until the 18th, and after that time evening star. She is in superior conjunction with the sun on the 18th at 6 h. 3 m. A. M., when she passes beyond the run and reappears on his eastern side as evening star. She is so far away and her diameter is so small that she will not be visible for several weeks; but some time in April she will be seen soon after sunset in the glowing twilight.

Venus rises on the 1st at 7 h. 3 m. A. M. On the 28th she sets at 5 h. 52 m. P. M. Her diameter on the 1st is 10", and she is in the constellation Capricornus.

MERCURY

is morning star. He arrives at his greatest western elongation on the 23d, at 5 h. P. M., being then 26° 50′ west of the sun. It is one of the three times during the year when the smallest of the planets is visible to the naked eye in the east, before sunrise, as morning star.

Mercury rises on the 1st at 6 h. 27 m. A. M. On the 28th he rises at 5 h. 31 m. A. M. His diameter on the 1st is 10", and he is in the constellation Capricornus.

NEPTUNE

is evening star. He is in quadrature with the sun on the 20th, at 5 h. A. M., being then 90° east of the sun.

Neptune sets on the 1st at 2 h. 16 m. A. M. He sets on the 28th at 0 h. 31 m. A. M. His diameter on the 1st is 2".6, and he is in the constellation Taurus.

JUPITER

is morning star, and when the month closes will be fair to see in the southeast before sunrise, for he rises more than an hour and a half before the sun appears.

Jupiter rises on the 1st at 6 h. 14 m. A. M. On the 28th he rises at 4 h. 49 m. A. M. His diameter on the 1st is 31", and he is in the constellation Sagittarius.

URANUS

is morning star. He rises on the 1st at 11 h. 20 m. P. M. On the 28th he rises at 9 h. 31 m. P. M. His diameter on the 1st is 3".6, and he is in the constellation Virgo.

Mercury, Jupiter, Mars, and Uranus are morning stars at the close of the month. Saturn, Venus, and Neptune are evening stars.

Failure of Another 110-Ton Gun.

At Gibraltar, January 17, while firing the 110-ton gun aboard the ironclad Benbow, defects were developed in the great gun that made it dangerous to do any further firing. Of the seven great 110-ton guns now in existence four are broken down, though they have never been subjected to the strain of half an hour's firing.

Navy Department Signals.

By a recent general order of the Secretary of the Navy, the following are the signals now used:

The American Morse code, having been adopted by the army, will be substituted for that now used by the navy.

The following is the American Morse code:

A - —	F · · — ·	K — · —	P · — — ·	U · · —
B — · · ·	G — — ·	L — · ·	Q — — · —	V · · · —
C — · — ·	H · · · ·	M — —	R · — ·	W · — —
D — · ·	I · ·	N — ·	S · · ·	X — · · —
E ·	J · — — —	O — — —	T —	Y — · — —
	Z — — · ·		& · — · · ·	

NUMERALS.

1 · — — — —	3 · · · — —	5 · · · · ·	7 — — · · ·	9 — — — — ·
2 · · — — —	4 · · · · —	6 — · · · · ·	8 — — — — ·	0 — — — — —

PUNCTUATION MARKS.

Comma · — · — · —	Interrogation · · — — · ·	Parenthesis Pn
Semicolon Si	Quotation Qu	Bracket Br
Colon Ko	Paragraph · — — · —	Dollar Marks Sx
Period · — · — · — · —	Exclamation — — · — · —	Dash Dx
	Hyphen Hx	Underline Ux

NOTE.—A fraction is made by inserting a dot between the numerator and denominator. Example: ⅞, — — — — · — — — — —

SIGNALS AND ABBREVIATIONS.

1. Wait a moment.
4. Start me.
5. Have you anything for me?
7. Are you ready?
8. Busy on other wires (or stations).
9. Train order (or important military message) give way.
13. Do you understand?
18. What is the matter?
27. Adjust your magnet (or flash).
30. Circuit closed (or close station).
44. Answer quick.
73. Accept compliments.
92. Deliver (ed).
134. Who is at the key (flag or torch)?

Ahr. Another.
Ans. Answer.
Ck. Check.
Col. Collect.
D H. Dead head.
G A. Go ahead.
G E. Good evening.
G M. Good morning.
G N. Good night.
G R. Government rate.
N M. No more.
O B. Official business.
O K. All right.
Opr. Operator.
Pd. Paid.
Qk. Quick.
Sig. Signature.

TO SIGNAL WITH FLAG OR TORCH.

The flagman faces exactly toward the communicating station; flag vertical in front of center of body, butt at height of waist. The *dot* (-) is represented by a motion to the right, and the *dash* (—) by a motion to the left of the sender. The *space*, whether separating elements of *spaced characters* (C, O, R, Y, Z, and "&") or separating words, will be represented by a "front" motion. Thus, the motions:

Right, right, front, right represent.....C
Right, front, right represent.....O
Right, front, right, right represent.....R
Right, right, front, right, right represent.....Y
Right, right, right, front, right represent.....Z
Right, front, right, right, right represent .....&

Each motion will embrace an arc of 90°, starting from the vertical and returning to it.

The *long dash* (letter "L" and numeral "naught") is distinguished from the "T" dash by a slight pause at the lowest point of dip, and with this exception there will be no pause whatever between the motions required for any single letter.

A slight pause will be made between letters.

At the end of each word, abbreviation, or conventional signal, the space signal, or "front" motion, is made, *preceded and followed by a pause* equivalent to that made between letters.

CONVENTIONAL SIGNALS FOR FLAG OR TORCH.

To call a station.—Signal the "call letter" of the station required, or, if the call letter be not known, signal "A" without pause until acknowledged; then proceed with the message.

To acknowledge a call.—Signal "I" three times followed by "front" and the call letter of the acknowledging station.

To break or stop the signals from the sending station.—Signal "A" without pause until acknowledged.

To start the sending station after breaking.—Signal "G A" followed by "front" and the last word correctly received; the sender will immediately resume his message, beginning with the word indicated by the receiver. If nothing has been received, signal "R R." The sender will then repeat all.

Error in sending.—Signal seven dots (- - - - - - -) rapidly, followed by "front," and resume the message, beginning with the last word correctly sent.

End of address.—Signal the period (- - — — - -), followed by "front."

Signature follows.—Signal "Sig" followed by "front."

To acknowledge receipt of a message.—Signal "O K" followed by "front" and personal signal or initial of receiver.

CONVENTIONAL SIGNALS FOR HELIOGRAPH OR FLASH LANTERN.

To call a station.—Turn a steady flash on the station and keep it there until answered by a steady flash. Both stations will then adjust, each on the other's flash. When adjustments are satisfactory, the station called will acknowledge and cut off its flash and the calling station will proceed with the message.

To acknowledge a call.—Signal "I" three times, followed by the "call letter" of the acknowledging station.

To break or stop the signals from the sending station.—Signal "A" without pause until answered by a steady flash.

To start the sending station after breaking.—Signal "G A" followed by the last word correctly received; the sender will immediately resume his message, beginning with the word indicated by the receiver. If nothing has been received, signal "R R," the sender will then repeat all.

Error in sending.—Signal seven dots (- - - - - - -) rapidly and resume the message, beginning with the last word correctly sent.

Adjustment.—If the receiver sees the sender's mirror needs adjusting, he will turn on a steady flash until answered by a steady flash. When the adjustment is satisfactory, the receiver will acknowledge and the sender will resume his message.

End of address.—Signal the period (- - — — - -).

Signature follows.—Signal "Sig."

To acknowledge receipt of message.—Signal "O K," followed by personal signal or initial of receiver.

CONVENTIONAL SIGNALS FOR TELEGRAPH.

To call a station.—Signal the "call letter" of the station required until acknowledged, signing at intervals the "call letter" of the station calling.

To acknowledge a call.—Signal "I" three times followed by "call letter" of acknowledging station.

To break or stop the signals from the sending station.—Open the key.

To start the sending station after breaking.—Signal "G A," followed by the last word correctly received; the sender will immediately resume his message, beginning with the word indicated by the receiver. If nothing has been received, signal "R R," the sender will then repeat all.

Error in sending.—Signal seven dots (- - - - - - -) rapidly and resume the message, beginning with the last word correctly sent.

End of address.—Signal the period (- - — — - -).

Signature follows.—Signal "Sig."

To acknowledge receipt of message.—Signal "O K," followed by personal signature or initial of receiver.

MESSAGES BY FLAG, HELIOGRAPH, TELEGRAPH, ETC.

The following will be the order of transmitting the several parts of a message: 1st, number of message and "call letter" of sending station; 2d, operator's personal signal; 3d, the check; 4th, place from and date; 5th, address in full; 6th, period (address complete); 7th, body of message; 8th, Sig. (signature follows); 9th, signature.

The "call letter," operator's personal signal, and check can be used only when previously agreed upon.

EXAMPLE.

The message.—

"WASHINGTON, D. C., January 1, 1889.
John Smith,
80 State Street, Boston, Mass.
Sent goods by express.
Thomas Adams."

Would be sent—

No 2 W 4 pd WASHINGTON D C 1 To John Smith 80 State Street Boston Mass. Sent goods by express Sig Thomas Adams

Abbreviations should not be used in the body of the message; numbers occurring therein must be spelled out in full.

This change of code does not affect the method of enciphering signal messages now in use in and between the army and navy.

Skill in Railroad Management.

The intelligent and efficient management of a large railroad system requires so much special knowledge that it is sometimes a matter of wonder that railroading should grow to such enormous proportions without the establishment of more departments of special investigation. About fifteen years ago the first department of physical tests in connection with a railroad was established, on the Pennsylvania Railroad, and shortly afterward the first railroad chemical laboratory was started on the same road. Since that time the number of railroad laboratories has increased slowly, until at present the total number in this country is but seven or eight. Where these have been managed well they have proved of great value to the roads owning them and indirectly to the other roads and to the manufacturers. Nor is it a matter of great expense to start one, as the machinery and outfit for a physical and chemical laboratory capable of pursuing all ordinary investigations would not exceed a cost of $5,000. These laboratories have made their impression upon railway practice in the past, more especially in the line of what is now known as routine work in testing supplies and improving specifications—work which was special in its nature when knowledge necessary to make good specifications had not been obtained and classified.

In the future, the *Master Mechanic* thinks, some of their most important work will be in the line of special investigation, and as competition becomes keener and the necessity of economy increases, the value of this department will be more generally appreciated, and the wonder will be howeve ever got along without them.

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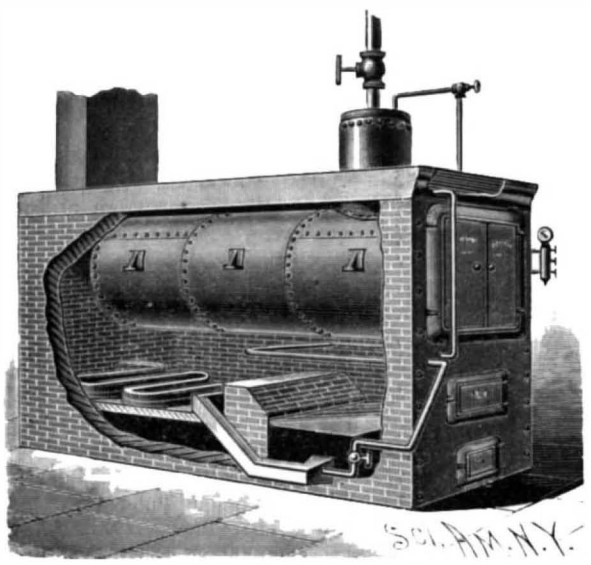
AN IMPROVED FURNACE.

A furnace adapted to be fired with waste fuel, such as coal dust, shavings, spent tan, etc., and at the same time serving as a generator for hydrogen gas, and to consume all noxious and waste gases, is shown in the

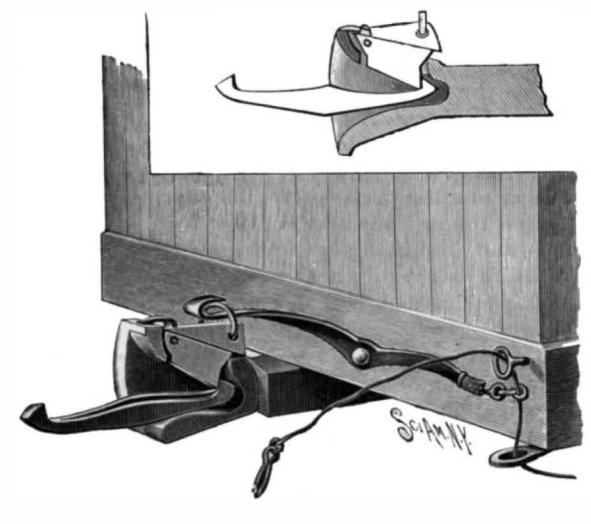


MILLER'S FURNACE.

accompanying illustration, and has been patented by Mr. Charles F. Miller, of No. 42 East King Street, Lancaster, Pa. A steam pipe leads from the dome of the boiler to a coil in the front of the boiler at the top of the channel leading over the boiler to the smoke stack. This coil forms a superheater, and from it a pipe extends downward into and around the top of the fire box, thence out and down to the ash pit, at one side, where at its extreme end it is perforated to form a nozzle, discharging inward through a cone-shaped funnel. From this funnel a pipe extends to the rear of the bridge wall, in which space it communicates with coiled branch pipes, finally extending out of the rear wall of the brickwork. The superheated steam, passed down through the fire box, is thus converted into highly heated gaseous steam, hydrogen, or water gas, and by its discharge under the grate bars acts as a blast forcing the fire, while also causing a draught of air from the pipe extending to the rear, the air thus drawn in being heated in its passage through the portion of the furnace to the rear of the bridge wall. The amount of air thus admitted is regulated by slides, while a valve regulates the supply of the superheated steam and gases discharged under the grate bars.

AN IMPROVED CAR COUPLING.

The illustration herewith represents a car coupling provided with means designed to enable a brakeman or engineer to uncouple cars at a point distant from the car to be uncoupled. The invention has been patented by Mr. James McG. Mason, of New Glasgow, Nova Scotia, Canada. The small figure shows a central vertical section through the drawhead, in which the coupling pin is pivoted at its forward end in a pin slot, the rear end of the pin being angled to form a lip adapted to engage the half arrow-head of the coupling link. The coupling pin is elevated by an angled lever fulcrumed upon the sill of the car, one member of the lever extending forward over the drawhead through a link in the top of the pin, and its extremity being bent over in hook shape. To this hook a cord or chain may be attached leading to the top of the car, for uncoupling from that point, uncoupling from the side of the car being effected by turning downward the other member of the lever. To uncouple from the engine, or to uncouple the last car of the train, eyes are attached to the bottoms of the cars and their sills, through which a cord may be passed, and a tension device is pivoted beneath the sill, its outer end twisted and extending beyond the sill facing the end of the lever. A spring key is introduced in the handle end of each of the levers, and a cord leading to the engine is passed through the several eyes, through the tension devices, and through the outer end of each spring key. By drawing upon this cord the handle end of the lever is depressed, raising the pin to release the link, and when the lever is downwardly inclined, the tension upon the cord releases the spring key, so that it may be withdrawn from the lever, and drawn through the rings of the last car until it reaches the eye attached to the same car at its forward end, when the same process of uncoupling may be repeated.



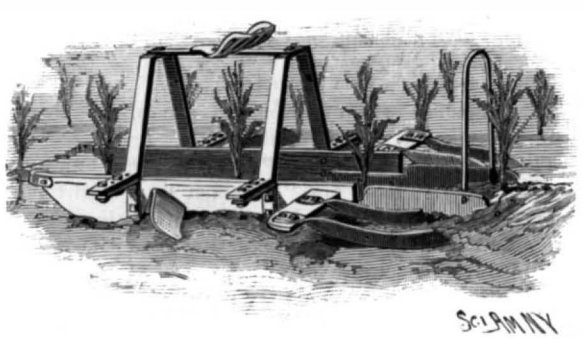
MASON'S CAR COUPLING.

A New Explosive.

Prof. Charles E. Munroe, of the United States Naval Institute at Newport, R. I, has discovered a new explosive which is said to possess most wonderful properties. It has greater power than any explosive now in use, while it possesses great chemical stability. Prof. Munroe has tested its safety vigorously. He found that it could not be exploded by a blow with a steam hammer or by glancing or direct blows from a heavy sledge hammer. It is a true chemical compound somewhat resembling the diazo compounds discovered by Greiss. It is smokeless and as nearly noiseless as an explosive can be, yet the claim is made that a single shell charged with it would sink the heaviest iron-clad afloat. Its manufacture is said to be safe and easy. The high reputation of Prof. Munroe gives great weight to any claims which he advances, and it is to be hoped that further particulars will soon be obtainable. The composition of his explosive is as yet a secret.

AN IMPROVED CULTIVATOR.

A cultivator adapted for use with listed corn, and capable of being adjusted to the corn when very young and in various stages of its growth, is shown in the accompanying illustration, and has been patented by Mr. Henry Loewenstein, of Kearney, Neb. The body of the device consists of two spaced parallel runners united by metal arches which support the seat. A fender having an upward and downward adjustment is secured to the rear end of each of the runners. To the outer face of each runner, near its rear end, is bolted an angle arm, upon the horizontal members of which are adjustably secured blades, twisted and curved in



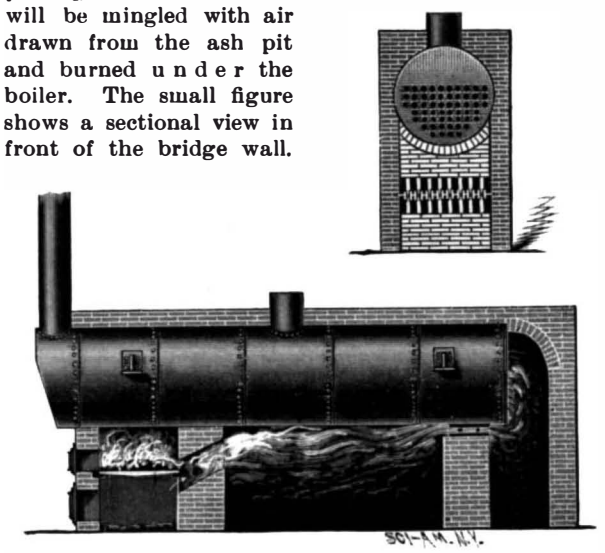
LOEWENSTEIN'S CULTIVATOR.

such manner that their inner faces will be more or less beveled, to form scoops to throw the earth against the roots of the corn. Near the forward end of each runner is secured a cutter having an essentially spiral twist, and adapted to pulverize the ground before the following blades contact therewith. The runners may be set at such distances apart as desired, according to the growth of the corn, and the scoop blades adjusted near the upper or lower edges of the runners, the fenders being dispensed with when the corn has grown tall.

THAT immoral and impudent bird, the sparrow, is in trouble again. He is a bird of notoriously bad character. He is a fighter, a thief, and an incurable glutton. The indictment which the Chester Farmers' Club has brought against him is enough to make more self-respecting birds thank their stars that they are not as he. The Cheshire farmers have been calculating that he eats one-tenth of all the grain that is grown in the country, and the cost of killing him is about a pound a thousand. If a farmer wants to exterminate birds, he must expect to be at charges for the salt to put on their tails—which in this case happens to be saltpeter. But the accusation of gobbling up the grain which ought to go into the barns is more serious. In the winter, too, the sparrows go into the farmyard and eat the grain intended for the poultry and feed at the pig trough with the pigs—which is surely a mark of great intelligence on their part. Still the Cheshire farmers must remember that all the world is not agreed as to the ingrained immorality of the sparrow. There are those who believe that they consume an enormous number of noxious insects when there is no grain to be had, and that consequently they do as much good as harm. That the sparrow is too numerous is most likely; but we need not have him exterminated. He is so cheerful, so "cocky," and so generally irrepressible, that life—in towns, at least—would be appreciably sadder without him.—*St. James Budget, London.*

AN IMPROVED FURNACE.

The accompanying illustration represents a furnace in which the bridge wall is built close up to the boiler, and has openings communicating with both the fire box and the ash pit, whereby unconsumed carbon and gases passing from the fire box will be mingled with air drawn from the ash pit and burned under the boiler. The small figure shows a sectional view in front of the bridge wall.



TERTELING'S FURNACE.

This invention has been patented by Mr. Theodor A. Terteling, of Kansas City, Kansas. The openings in the bridge wall are arranged to slant upwardly, and the inner ends of the grate bars open about midway of the front ends of the openings. The tops of the openings may be horizontal instead of inclined, as shown.

For further information relative to this invention address the inventor or Mr. Robert L. McAlpine, Box 226, Kansas City, Kansas.

Pasteur Statistics.

According to the report published in the *Annals* of the Pasteur Institute, there have been treated at that institution from November 1, 1888, to November 1, 1889, 1,830 persons bitten by rabid animals, of whom 11 have, in spite of the treatment, succumbed to hydrophobia. This gives a mortality of 0·60 per 100. Deducting, however, the number of persons (4) who died during the treatment or in the fifteen days which followed it, the mortality is reduced to 0·38 per cent, which figure is still inferior to that of the preceding years. It has been established that the number of deaths after treatment is becoming more and more reduced. For this year it is 1 per cent, whereas the mortality of cases not treated is less than equal to 15 per cent.

AN IMPROVED ASH SIFTER.

The illustration herewith represents an ash sifter in which inclined screens and dust and ash receptacles are so arranged in a casing that the sifting may be effectively done, and the receptacles readily removed to be emptied of their contents. It has been patented by Mr. Samuel Sudlow, of No. 295 Ewen Street, Brooklyn, E. D., N. Y. Directly beneath a covered hopper at the top of the casing is supported an inclined screen adapted to discharge ashes, etc., upon a second screen having an opposite inclination, the screens being held upon cleats and readily removable. An inclined board directs the dust and ashes from the top screen against the second screen, the screenings passing through which are received in a receptacle or drawer opening out from the back of the casing. A drawer opening out from the front of the casing at the bottom receives the cinders and coarser particles which do not pass through the screens, and there is nested in this drawer an independent receptacle which may be separately lifted out, and its contents again dumped into the hopper if a second screening is desired.

SUDLOW'S ASH SIFTER.

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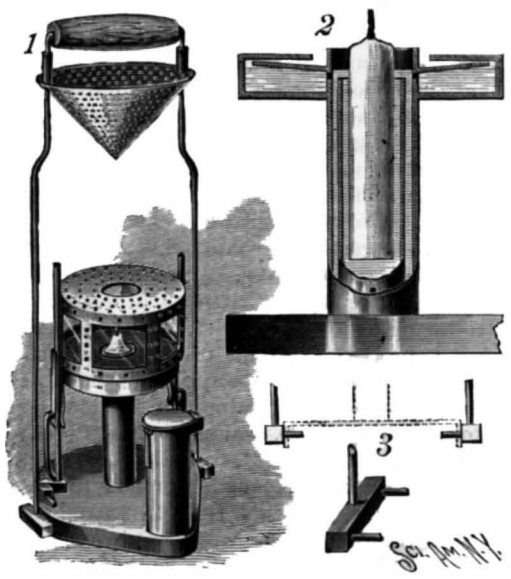
TWO IMPROVED CANDLESTICKS.

In the illustrations herewith are represented two improvements in candlesticks for which patents have been issued to Mr. John P. Nessle, of No. 23 Frelinghuysen Avenue, Newark, N. J. In the hydraulic candlestick



NESSLE'S HYDRAULIC CANDLESTICK.

the candle is seated in a tube containing water, the candle rising automatically as its bulk is lessened by consumption, Fig. 1 being a perspective view of the device, with a bail for carrying it when used as a lantern, while Fig. 2 represents a central longitudinal section. On the base plate is a match box and a central tube, the upper end of which is fixed in a reservoir, as shown in Fig. 2, openings from the tube communicating with the interior of the reservoir. Within the central tube is a slightly smaller tube, forming an annular space between the walls of the two tubes, the inner tube having a series of openings near its bottom. Two upwardly extending rods, having their lower ends fixed to the base plate, are placed on opposite sides of the reservoir, above which a circular adjustable frame is held, provided with panes of glass or other transparent material. Fig. 3 represents details of the bail, which has an inverted conical guard between the upper sides of its arms to protect the hand from the heat of the candle. The reservoir and tubes are filled with water as shown in Fig. 2 when the candle is placed therein, with its head or wick end above the water, the water from the reservoir flowing into the tubes as the candle is burned to support it always at the same height. The candlestick shown in the second illustration has a weighted sliding frame with an opening for the reception of the candle, the frame descending as the candle is consumed, whereby the lighted end of the candle is at all times held in a fixed position in relation to the frame, and the melted part of the candle is turned inward toward the burning wick, and prevented from running down the sides. The weighted frame consists of two plates connected by a series of fixed rods, each plate having a central opening for the reception of a candle tube, while a transparent frame with perforated top plate is held over the burning end of the wick. The top of the candle tube has a sharp inner flange, as shown in the small view, to force the melted part of the burning candle inward toward the wick, and cause its complete combustion. The candle supports the weighted frame, which gradually descends on parallel vertical rods fixed to the base plate as the candle is burned, the central standard on which the candle is seated within the candle tube being of sufficient length to hold the candle in position until the last particle is burned.

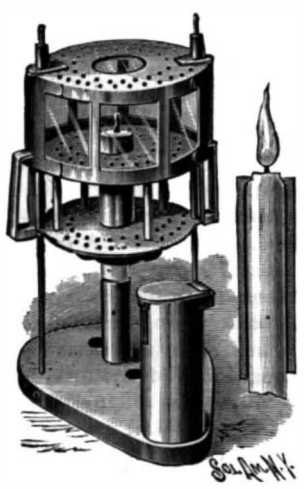
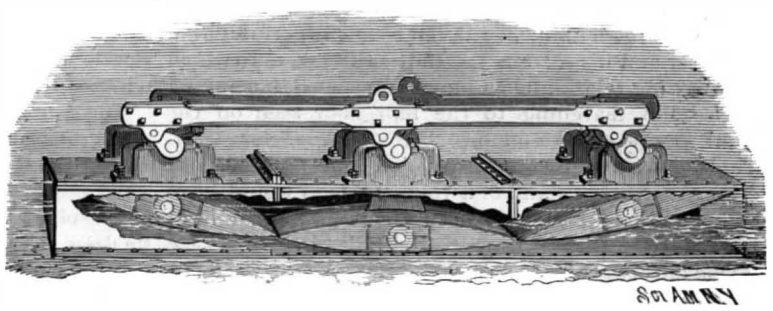


Fig. 2.—NESSLE'S CANDLESTICK.

AN IMPROVED WATER MOTOR.

A water motor adapted to be set in a stream or current to utilize the power of the water to the fullest advantage under any given head or current is illustrated herewith, and has been patented by Mr. Edgar Courtright, of St. Ignace, Mich. The mechanism is inclosed in a box open at both ends, in which paddles are placed one behind the other, the paddle blades being mounted to slide vertically on sets of guide rods, so as to be free to oscillate. Crank arms, set at an angle to each other, are pivotally connected with arms extending downward through suitable slots, the lower ends of the latter arms being rigidly connected with the paddle blades, while the crank arms are also adapted for connection with suitable shafting or other means for the transmission of the power obtained. By this construction the paddle blades always present to the incoming water an obstructing surface against which the water acts, the water exerting a straight pressure in the direction of its travel, and the angle of obstruction being constantly changing. For further information relative to this invention address the inventor or Messrs. Stellwagen & Kynoch, St. Ignace, Mich.



COURTRIGHT'S WATER MOTOR.

ERICSSON'S HOME.

BY PROF. C. W. MACCORD.

On the 16th of November, possession of the house at 36 Beach Street, so many years the home of Captain John Ericsson, was given up to the purchaser, by whom it is to be converted into a tenement house, and thus disappears the last vestige of the respectability which once characterized that locality.

No doubt many who visited the spot on the occasion of his funeral were surprised that so eminent a man should have lived and died amid surroundings so dismal and forlorn. But it must be remembered that when the captain went there, twenty-seven years ago, the unsightly pile of brick which now makes that neighborhood hideous did not exist, but in its place was one of the most attractive of the few small parks in the city, and it was the fact that this open space gave him an unobstructed light from the north that determined his selection. Some signs of decadence there may have been, as seen in the circumstance that some of the residences were already used as boarding houses, but they were of the better class, patronized by gentlemen who preferred to live near their places of business; and had St. John's Park remained, as it ought to have done, the neighborhood would not have deteriorated so rapidly as it has. The house adjoining his new abode was one of these, and the second floor was occupied by a gentleman with his wife and daughter, who, in arranging their possessions, had placed the inevitable piano in such a position that as the captain sat at his favorite table, the instrument was within a few feet of his head, with only a party wall intervening. Now, though no musician, Captain Ericsson was fond of music, still in these circumstances he was likely to hear more of it than he wished, and that without having a voice in regard to either the time, the quality, or the selections.

He certainly was not sensitive as to ordinary street noises, or he never would have remained where he was after the destruction of the park; but some other sounds, which other people might never have noticed, annoyed him beyond measure. For example, in his previous residence on Franklin Street, he had often been disturbed by the untimely crowing of cocks which inhabited coops in neighboring yards, and more than once had his secretary been charged with the task of abating the nuisance by buying up all the chanticleers within two blocks. This, naturally, procured only temporary quiet, and the process had to be repeated at frequent intervals. Perhaps the hope of escaping this and kindred vexations by removal may have led him to exaggerate the new trial of his nerves by a surfeit of Czerny and Chopin; at any rate, a trial it was, and his expedients for securing relief were curious and characteristic. The first scheme was to set up an opposition, though that is hardly the word either, since he did not attempt a retaliation by which his neighbors could possibly be troubled. He purchased a large and powerful but sweet-toned music box, and when the practice upon the piano began, he would touch the spring, and fill his own room with various inspiriting strains. This, however, proved ineffective. The supply of music from within soon became as monotonous as that from without, and did not wholly drown it either. This experiment failing, he sent to ask whether it would not be possible to have the objectionable instrument placed elsewhere, but this suggestion was coldly received, and naturally enough was met by the counter suggestion that the captain might remove his table to the window at the opposite end of his own room. But this seemed to him utterly out of the question. His table had been placed in an alcove, which he had formed for that express purpose by removing the partition originally separating the "hall bedroom" from the large parlor on the second floor. It was his chosen spot, and besides at the opposite end of the room was the fireplace, and as a military man, he said, he could never endure a fire in his rear.

Again his lieutenant was dispatched with a flag of truce, instructed this time to arrange if possible for the removal of the owners as well as the instrument to other quarters, Captain Ericsson offering to take the lease off their hands, pay a year's rent of any house they might select, and defray all expenses of removing. But the attractions of the beautiful park were too strong to be thus overcome, and these overtures also were rejected. The negotiations, however, had shown that the temper of the enemy was not implacable, and a compromise was finally effected by the adoption of an expedient for deadening the sound. At the captain's expense, of course, the whole wall at that side of the room on which the piano stood was covered with mattresses, which were covered by an upholsterer with tasteful hangings of colored rep, selected to accord with the other furniture, and thereafter harmony reigned on one side of the wall and peace upon the other.

ERICSSON IN HIS STUDY.

We give a representation of this alcove, showing the captain seated at his table, upon which were placed his drawing board, and neatly arranged at his left hand, his drawing instruments. These were few and simple, but used with matchless dexterity. As a draughtsman Ericsson had no rival, past or present, and the outlines of new devices grew upon the paper as if by magic.

His seat at the table consisted of an ordinary piano stool, which proving neither high nor hard enough to suit his fancy, he had

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it covered with a square pine box with rounded corners.

Behind him is seen another table, upon which, sometimes growing drowsy of a summer afternoon, he would stretch himself for a nap, using as a pillow either a copy of Worcester's Dictionary or, more often, the removable cover of his piano stool. At first he used this table in its original form; but as it was rather short, his feet were thus left dangling over the end; this he subsequently remedied by piecing it out, as shown at the farther end in the cut. And yet this walnut table, with its thin oilcloth cover, was only one degree less hard than the bed to which he retired at midnight for his seven hours of sound and dreamless sleep.

On a projecting pilaster near the left of his drawing table will be observed two bell pulls, marked respectively "L" and "T" These were later additions, leading to the room above, occupied by his superintending engineer and his secretary. In the early days to which this writing relates, he employed no such labor-saving device, but, marching to the hall door seen on the right, he would summon "Mr. Lassoe" or "Mr. Taylor," with a deep chest voice, not musical, but clear as a trumpet, and of a volume which would have wakened them had they been sleeping, and at least have startled them if they had been dead.

One mechanical appliance, however, there was even then in this room. His fireplace, which in winter was generously fed with Cumberland coal, had, as he conceived, some affection of the throat, which he proceeded to treat in a manner of his own. He had made for it a cast iron damper, turning on pivots at the ends, and operated from the front by means of a rod fitted with a screw and a polished hand wheel; the tracings for which were duly returned from Delamater's marked with the shop name, "Reversing gear for Capt. Ericsson's fireplace," a bit of humor which he keenly enjoyed; if there was no music in his voice, there was no lack of it in his laughter, which was free, hearty, and contagious.

It is understood that an exact reproduction of this room is to be constructed in the royal museum at Stockholm, in which are to be placed all the articles of furniture which it contained, arranged precisely as they were during the captain's lifetime. Besides those shown in the cut, these comprised only one or two more chairs, a small oval table, an iron safe, a fire screen, and a well filled book case. Upon the oval table was a model of a gun carriage, with a gun for firing torpedoes, which, having been brought down some years ago for exhibition to some gentlemen interested in the subject, happened to be left there, and it is the only model which ever was in this room for any length of time.

This table stood against the wall, a little in front and to the left of the larger one seen in the cut, and directly under a portrait of Gustavus Vasa Fox, Assistant Secretary of the Navy at the time when the Monitor was built. It has been imaginatively stated that the walls of the captain's house were profusely decorated with "large mechanical drawings, in which he would revel during some of his hours of rest;" the fact is that but three things were ever hung upon his walls. One was this portrait; another was the framed copy of the complimentary resolutions passed by the State of New York on the occasion of the naval battle in Hampton Roads; and the third was a portrait of a lady, in oil, which, however, did not belong to Capt. Ericsson, but to a friend of his; these last were hung, one in the large reception room on the first floor, the other in his dining room, which was the "back parlor" on the same floor. In one corner of this room stood a small column, surmounted by a bust of Edwin W. Stoughton; in front of a fine mirror on the mantelpiece were four urns or vases, turned out of timbers from the Merrimac, the Hartford, and the Cumberland; besides which this room contained nothing whatever, except a dining table and half a dozen chairs; his models were arranged on the mantel and on tables, in the reception room. It is not to be understood that the captain's fondness for music was such as to lead him to attend operas or concerts; at least in his later years, he never would have spared the time for that. But over his work he would whistle like a blackbird, and the fact that he whistled well may be taken as an indication that his ear at least was correct.

And if the music came to him, he gave it no unwilling ear—he listened with delight to the serenade given on his last birthday by the Swedish residents of the city; nor was the time begrudged when on one memorable day his room was the scene of a notable and unique musical entertainment—the old walls rang with the rich tones of a superb Gaspar di Salo, the audience was John Ericsson, the performer was Ole Bull.

This meeting between these two sons of the Northland would have furnished a fit theme for an artist's pencil; both were men of remarkable and impressive presence, the tall and stately pine of Norway towering far above the sturdy oak of Sweden, while the leonine head, with straight and snowy hair, of the famous musician, formed a striking contrast to the brown, waving locks and the bronzed face of the no less famous engineer.

Upon the roof of this house the new purchaser will find a structure that possibly may excite his wonder—a wooden breastwork, perhaps four feet high and fourteen feet square, entered at one corner by a winding staircase leading from a scuttle in the roof; within this is a small house capable of being rotated like the turret of a monitor, by gearing operated through the intervention of a worm-wheel and a crank. This is the observatory erected by Captain Ericsson immediately upon his taking possession in 1862; and within it were conducted many of the patient and elaborate investigations relating to the solar temperature, and experiments with a view to utilizing the sun's heat as a source of motive power, which occupied much of his time during the succeeding years, and prove that advancing age had not robbed his brain of its vigor nor his hand of its cunning.

And somewhere in the cellar he may find what will puzzle him still more—the remains of another but less successful device of about the same date.

The captain had found his occupancy disputed by a numerous horde of rats, who considered themselves tenants at their own will, and stubbornly refused to yield possession. Regarding the situation as a problem to be solved by mechanical means, with his own hands he drew the plans for a vast and mighty trap. To the leading idea (of a water tank beneath a trap door) he laid no claim, but the details were wholly new and upon an unheard-of scale. Tracings were made by an assistant draughtsman, and went the rounds of the shop; the pattern maker, the brass founder, the finisher, the carpenter, the tinsmith, each had a share in this novel work. At last it was completed and erected; it filled up half the basement, and was baited with half a cheese. He had originally intended to use a whole one, but though cost had been disregarded in making the trap, he suddenly became gravely economical in the matter of bait, and at last decided that one moiety would suffice; the other being placed in an adjoining room, to guide the noble army of martyrs in the road to ruin. But he had underestimated the cunning of the rodents; as a place for keeping cheese in safety, the ponderous engine answered admirably, but it did not even frighten away the obnoxious animals; and he was forced to admit that "these little beasts have brains altogether too big for their heads."

Before this time, when some over-ambitious and unsuccessful piece of mechanism came to his notice, he used to say, like many another, "The man who contrived that couldn't plan a rat trap." And the force of habit sometimes impelled him even afterward to use the same familiar ejaculation; but the memory of this failure was ever present with him, and with a merry twinkle in his clear blue eyes he invariably added, "And I couldn't do that, either."

The room herewith illustrated has been in many cases alluded to as Ericsson's "workshop." Though here he certainly accomplished a prodigious amount of work, the word conveys a most erroneous impression as to its nature. Experimental engines of various forms were, to be sure, erected and tested in his house, though not in this room; but they were built elsewhere, chiefly at the Delamater works, and set up by the machinists who made them. These were at different times to be seen running in the rooms on the third floor, as well as in the yard in the rear, where a large platform will be found, which was made for the accommodation of his "solar engine."

But his work in connection with these engines (after he had made the plans for them) consisted simply in superintending the tests and trials; as for models, those, too, he had made when he wanted them, but nothing could be farther from the truth than to imagine him as engaged in the actual construction of mechanism of any sort; nor will any traces of a "workshop" be discovered, for the simple reason that no such thing ever existed.

How Ericsson Came to America.

Previous to his transfer to this country, in 1829, John Ericsson had an experience of seven years in the study of artillery and other subjects, as an officer of the Swedish army, and had practiced his profession as a civil engineer in England for thirteen years. During this time he gave special attention to the subject of marine engineering, and successfully applied the screw propeller as a substitute for the side wheel. In 1837 Lieutenant (afterward Captain) Robert F. Stockton, U. S. N., visited England on leave of absence. There he met Ericsson, and at once fell in with his ideas on the subject of naval construction. Three years before, Ericsson had planned a 12 inch wrought iron gun, and with this Stockton also fell in love. He was at this time a warm advocate of the introduction of steam into the American navy, and he gave Ericsson the most positive assurances of his ability to procure authority to build a steam frigate for the United States navy.

Encouraged by this and by other assurances that there was a fine opening for him on this side of the Atlantic, Ericsson resigned the position he held as supervising engineer of one of the leading English railroads and removed to New York. He brought with him here a wrought iron 12 inch gun, forged in England after his plans, and paid for by Captain Stockton. To this gun was subsequently given the name of the "Oregon." It was tried at Sandy Hook, and after trial was surrounded by three hoops or bands to strengthen it. Thus re-enforced, it was fired in the neighborhood of 200 times, often with charges expressly designed to test its strength. How thoroughly it endured the severe ordeal to which it was subjected can be seen by examining the gun. It is still in existence and may be found at the Brooklyn Navy Yard in company with an iron target, 4½ inches thick, through which it pierced a hole in 1842, the gun being aimed by Ericsson himself.

On his arrival in this country, Ericsson found that Stockton had no immediate use for him or his gun, as he was not able to realize his somewhat too confident expectations of getting without delay an order to build a steam vessel for the navy. The order did not come until 1841, and meantime Ericsson had devoted himself to introducing his screw into merchant vessels, fitting up 24 merchant vessels and one revenue cutter with this contrivance before it was applied to the Princeton. Ericsson had brought with him from England complete plans for a steam frigate, and as soon as Stockton got authority, in the fall of 1841, to build it, he applied to him for his assistance. It is important to remember the progress made at this time in introducing the screw, for Ericsson's success with that has been erroneously ascribed to its introduction on the Princeton. He was in the full tide of success when he dropped his work to build a war frigate for our navy.—*Army and Navy Journal.*

Manganese.

A new mode of preparing manganese, by which the metal can be obtained in a few minutes in tolerably large quantities and almost perfectly pure, is, says *Nature*, described by Dr. Glatzel, of Breslau, in the current number of the *Berichte*. A quantity of manganous chloride is first dehydrated by ignition in a porcelain dish, and the pulverized anhydrous salt afterward intimately mixed with twice its weight of well-dried potassium chloride. The mixture is then closely packed into a Hessian crucible and fused in a furnace at the lowest possible temperature, not sufficient to volatilize either of the chlorides. A quantity of metallic magnesium is then introduced in small portions at a time, the total quantity necessary being about a sixth of the weight of the manganous chloride employed. Provided the crucible has not been heated too much above the melting point of the mixture of chlorides, the action is regular, the magnesium dissolving with merely a slight hissing. If, however, the mixture has been heated till vapors have begun to make their appearance, the reaction is extremely violent. It is therefore best to allow the contents of the crucible, after fusion, to cool down to a low red heat, when the introduction of the magnesium is perfectly safe. When all action has ceased, the contents of the crucible are again heated strongly, and afterward allowed to cool until the furnace has become quite cold. On breaking the crucible, all the potassium chloride and the excess of manganous chloride is found to have been volatilized, leaving a regulus of metallic manganese, fused together into a solid block, about three parts by weight being obtained for every two parts of magnesium added. The metal, as thus obtained, is readily broken up by hammering into fragments of a whitish-gray color possessing a bright metallic luster. The luster may be preserved for months in stoppered glass vessels, but, when exposed to air, the fresh surface becomes rapidly brown. The metal is so hard that the best files are incapable of making any impression upon it. It is so feebly magnetic that a powerful horseshoe magnet capable of readily lifting a kilogramme of iron has no appreciable effect upon the smallest fragment. It was noticed that the introduction of a small quantity of silica rendered the manganese still more brittle, and caused it to present a conchoidal fracture, that of pure manganese being uneven. The specific gravity of the metal, former determinations of which have been very varied, was found to be 7·3921 at 22° C. This number, which was obtained with a very pure preparation, is about the mean of the previous determinations. Dilute mineral acids readily dissolve the pulverized metal, leaving a mere trace of insoluble impurity. It is also satisfactory that practically no magnesium is retained alloyed with the manganese, and the introduction of carbon is altogether avoided by the use of this convenient method.

Spanish.

From the beginning of the year the SCIENTIFIC AMERICAN, so well known throughout the world in general, and North America in particular, as purveyor of scientific news, will publish a special monthly edition in Spanish, so that it will be equally well known in the numerous countries in South America, from Cuba to Chili and Brazil, where the Spanish language is almost universally spoken.—*The Electrical Engineer.*

[Yes; that is so. The publication has been already commenced, and it promises great success.—ED.]

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SEA-GOING TORPEDO BOAT No. 1, UNITED STATES NAVY.

(*Continued from first page.*)

Area of wetted surface at a draught of 4·5 feet	1701·00	square feet.
At deep load draught, 5·2 feet	1895·00	"
Area of longitudinal immersed section	424·2	"
Center of buoyancy :		
Below L. W. P.	1·51	feet.
Abaft Section 45	1·62	"
Below C. of G. of total weight	2·38	"
Center of gravity of total weight abaft Sec. 45.	3·63	"
Metacenter, transverse, above L. W. P.	3·22	"
" " " C. of B.	4·72	"
" " " C. of G.	2·31	"
" longitudinal, above L. W. P.	339·90	"
" " " C. of B.	341·41	"
" " " C. of G.	338·99	"
Coefficients of fineness :		
Displacement	0·37	
Midship section	0·67	
L. W. plane	0·67	
Mean of water planes	0·55	
Center of lateral pressure forward of Sec. 45	5·5	feet.
Below load water plane	1·91	"

The average length of all plates in the shell plating, as far as practicable, covers nine frame spaces, or 162 inches. The thickness of deck and bottom plating varies from 5-64 to ¼ inch, and was moulded to the form of hull and bent into shape cold. All rivets under one-half inch diameter were also driven cold.

The frames are steel angles spaced 1·5 feet from center to center. The reverse frames are riveted to them and to the top of the floor plates, above which they extend; those abreast of the engines and boilers extend to the brackets connecting with the deck beams. Double frames are placed at all water-tight bulkheads.

The flat keel plates are riveted to each frame and securely bolted to the stem and stern posts. Both stem and stern posts are of forged steel, rabbeted to receive the bottom plating, moulded to the angle of entrance and run at the several water lines, and extend from the sheer rail to eight feet along the keel from spur of ram. The stern post, in addition, is forged with an eye to receive the case bearing of the rudder stock.

The keelson consists of a steel I beam, as shown in Plate I., which tapers at the forward and after ends. The sections are butted between frames and securely riveted to each other and also to the reverse angles and the short angles on opposite side of floor plates. The forward end butts on and is bolted to a water-tight bulkhead six feet from the stem, while the after end is similarly attached to a water-tight bulkhead 14·5 feet from the stern.

The deck beams are composed of steel angle bars, and are placed at every frame, to which they are connected by bracket plates. Stringer angles of the greatest possible length extending from stem to stern post are securely riveted to stringer plates and sheer strakes; these, in connection with the elliptical steel deck, give great rigidity to the structural strength of the boat, and increase her capacity to resist the shock of waves when driven into a head sea.

There are ten water-tight bulkheads, constructed of steel plates lap-jointed, single-riveted, and strengthened by vertical stiffeners, and these divide the boat into eleven water-tight compartments.

CUBIC FEET OF AIR SPACE IN COMPARTMENTS.

	Cubic feet.
Compartment No. 1, fore peak	30
" No. 2, general storeroom	225
" No. 3, torpedo room	1,092
" No. 4, galley and dynamos	566
" No. 5, forward boiler room	1,894
" No. 6, engine room	2,183
" No. 7, after boiler room	1,987
" No. 8, machinists' room	839
" No. 9, cabin	900
" No. 10, pantry and storeroom	285
" No. 11, tiller room	60

There are four bulkheads between the stem and forward boiler. The longitudinal bulkheads, which are continuous and form the coal bunker fronts for fifty seven feet of the middle length abreast of boilers and engines, are secured to the deck and bottom plating by fitted intercostal angles, to which they are riveted.

Powerful ejectors are connected with the water-tight compartments, having a total capacity of 870 tons, or 100 tons in about seven minutes, and it is calculated that these will be capable of freeing the compartments of water under all circumstances, as their action is regulated by the auxiliary engines, and therefore independent of the main engines.

A whale back extends from the stem to the forward conning tower, a distance of thirty feet; the remainder of the deck is elliptical.

The conning towers are of ¼ inch steel plate, and are fitted with a steam steering and hand wheel, both of which are capable of being thrown out of or into action at the will of the helmsman. Electric connections and speaking tubes, with all modern improvements, are fitted in both towers, communicating with the engine room, the two fire rooms, and the torpedo room.

The rudder is suspended, and has an area of fourteen square feet; it is made of common hard bronze, and connects with the steering gear direct.

Twenty ventilators give a free circulation of air in the several compartments in fair weather. When closed in bad weather, ventilation is induced by connection with the boiler spaces and jacket of smoke stack.

Boats and anchors are hoisted by steam. The dynamos for electric lighting and for the search light are located immediately under the forward conning tower The torpedo room is located in compartment No. 3, under the whale back. This is also the forecastle and quarters for the crew, and is fitted up with steel wire berths, which fold up against the sides of the hull during the day, thereby leaving free access to transoms and lockers, which extend the entire length of the forecastle. These quarters, which will accommodate twelve of the crew, are finished in hard wood, are commodious and well ventilated, having all the modern improvements, including steam heating, electric lighting, etc.

The loading of the torpedoes and the charging of the launching tubes from the racks, as well as the handling of the breech mechanism, are conducted in this compartment.

In the compartment forward of this are located the auxiliary engine for steam capstan, and the steam motor which spins the flywheel of the torpedo up to a speed of 10,000 revolutions in one minute.

The torpedo can be launched by means of electric connections, from one or both tubes, at the will of the commander in the conning tower.

The launching may be made at full speed with the helm hard over, and not affect in any way the line of direction with the object fired at, which the torpedo had in the interval between leaving the tube and striking the water. This is an absolute achievement in torpedo warfare which has never been accomplished by any other torpedo boat in existence, and therefore increases the value of the factor of safety of torpedo boats in an attack, inasmuch as they will be able to discharge torpedoes when at full speed.

The machinists' quarters are between the cabin and after boiler bulkheads.

The cabin is finished in hard wood, and is immediately abaft the after conning tower. It will accommodate four officers. Abaft the cabin is located the pantry and store room for officers.

There are two separate quadruple expansion engines, vertical direct acting, with cylinders to each engine as follows: High pressure 11¼ inches diameter, first intermediate 16 inches diameter, second intermediate 22½ inches diameter, and two low pressure 22½ inches diameter each.

The stroke of all pistons is 15 inches, working on five cranks placed relatively to each other to give the least vibration to hull. The balanced piston type of valves is used, working from an eccentric shaft connected by spur gearing to crank shafts. The high pressure cylinder will take steam at about 225 pounds pressure.

The engines are practically noiseless, and easily reversed by one man. The cylinders have their axes in the vertical longitudinal plane of the shafts, and are supported on twelve forged steel stanchions, 1½ inches diameter, above bed plate.

The stanchions bolt through pillow blocks, bed plate, and strengthening plate, and are set up with lock nuts. The bed plate is of rolled steel ⅞ inch thick, finished, and supports pillow blocks, stanchions, crank and eccentric shafts. There is one piston rod to each cylinder which extends through the lower head only. The other chests are placed on the side of the cylinders, each chest having its own separate cover. Relief valves are fitted at the middle length of and in the plane of the axes of each cylinder and its valve chest, at right angles to the line of the crank shaft. The high pressure is set at 260 pounds, the first intermediate at 130, the second intermediate 65, and second low pressure at 65 pounds. Equalizing pipes connect relief valves and receiver pipes.

Diagonal rods are bolted to bed plate and main stanchions; the crosshead slides and guides are bolted to parallel bars which are secured to main stanchions. Crank and eccentric shafts are of forged steel. The crank shafts are 5 inches in diameter and are in two sections. The long section takes the second intermediate and two low pressure connecting rods; the short section, the high and first intermediate. Both sections are connected by coupling disks. Each section carries its own counterbalance. The cylinders are of cast iron, pistons of cast steel, piston and connecting rods of forged steel.

The line and propeller shafts are of forged steel, 5¼ inches diameter. Eight collars take the thrust of each shaft.

Each engine will develop 800 indicated horse power, which is calculated to drive the boat at a speed of 23 knots, with a coal consumption of about 3,800 pounds per hour. The bunker capacity is 37 tons, which gives a radius of action of 3,000 miles at 10 knots per hour. Propellers are of hard bronze, galvanized, 50 inches diameter, four blades each, and turn outward in forward motion.

Auxiliary engines are of single type, and connected to exhaust into the condenser. The main feed and air pumps for each main engine are worked by independent engines. There are two blowing engines, one for each fireroom, and one engine to work a centrifugal circulating pump. A donkey pump is located in each fireroom, and connected to draw either from the condenser, supply tank, the sea, or bilge suction pipe, and discharge into boiler, fireroom, on deck, or overboard.

All engines exhaust into the condenser, and the main engines can exhaust into the air in case of accident to the condenser. The latter is located between the low pressure cylinders and bolted to the keelson and floor plates. It has a cylindrical copper shell, tinned on the inside and out, tube sheets of brass tinned on the inside. The exhaust steam from all engines is received into the brass part of the shell, and surrounds the tubes, while the refrigerating water passes once directly through the tubes. A brass chamber connects each end of the shell with copper pipes, which lead to holes in the bilge stroke. A single-acting independent pump keeps the tubes full.

Steam is supplied to the engines by two Thornycroft boilers, built at the Herreshoff works. These will give a working pressure of over 200 pounds per square inch, with a ratio of over 66 to 1 in heating surface to that of grate, and so arranged as to supply steam separately or in connection to one or both engines.

These boilers are steam generators of the kind wherein the water is exposed to the action of heat while passing in tubes between two horizontal cylindrical water chambers located longitudinally at either side of the fire grate space, to a horizontal cylindrical steam collector and separator located longitudinally above and in the middle line of the fire grate space.

The steam collector and separator is connected by two series of tubes with the two water cylinders, or with two parts of the same. The tubes are arranged in groups, and all the tubes of one group stand in the same vertical plane, or approximately so. Each tube is connected at its lower end to the cylinder and at its higher end to the upper side of the steam collector and separator.

The groups of tubes stand side by side, and are so disposed that the double row formed by the two outer tubes of each group, and likewise the double row formed by the two inner tubes of each group, constitutes a wall or partition above the fire grate, except near the upper and lower extremities of the tubes. It will thus be seen that these two walls inclose between them at each side of the grate a space which acts as a flue for the ascent of smoke and gases from the grate to the uptake.

The first and last group of tubes at each side are shaped differently from the others, so that a partial wall or partition is formed at each end of the grate to inclose the furnace.

The lower side of the steam separator is protected from the flame by a shield of non-conducting material, which connects the walls of tubes at either side and constitutes the roof of the furnace. The latter is provided with fire doors, at the after end in the forward boiler, and at the forward end in the after boiler. Firebrick deflecting plates are located at the ends and sides of the fire grate. Chambers arranged at the ends of the boilers are provided with valves for the admission of air for cooling parts of the boiler and fireroom.

One chamber is in communication with the ash pan, the other with the atmosphere. An additional chamber is provided, which is in communication with the ash pan, and has an outlet that is normally closed by a loaded valve that will open to admit of the escape of steam in case a tube should burst when working the boilers at their maximum capacity.

This arrangement secures the firemen from being scalded or driven from the fireroom when working under forced draught.

The steam collector and separator has a steam pipe extending the greater part of its length. This pipe is protected by one or more baffle plates, over which the mixed water and steam rising through the tubes is poured. The water falls into the lower parts of the separator and descends through two large return tubes to the water cylinders at each side of the grate.

The steam turns under the baffle plate and enters the steam pipe and thence to the engines.

The collector and separator is provided with safety valves and gauges. One of the safety valves is constructed in combination with a stop valve or regulator.

The armament will consist of three rapid-firing six-pounder Hotchkiss breech-loading rifles, as shown in the plan, and two or more Gatlings, mounted in favorable positions elsewhere.

Considering the practical results that have been achieved with the sea-going class of torpedo boats of the Thornycroft, Yarrow, and Schwartzkopf type, which have developed high rates of speed over the measured mile, a maximum of efficiency in this boat is looked for by the department and the builders.

It is purely an American type of sea-going torpedo boat, in which the speed trial is to consist of a continuous run of three hours' duration, during which time the boat must attain a mean speed of twenty-two knots per hour.

This condition eliminates the possibility of bottling up the steam for a spurt of three minutes or less over

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a mile course, wherein the ratio of speed per hour may be calculated from a series of such trials.

Premiums of $2,000 and upward are offered for each quarter of a knot in excess of 24 knots per hour, whereas a penalty of $4,000 will be exacted if the speed falls below 22 knots.

These are the conditions surrounding the building of the first sea-going torpedo boat on this side of the Atlantic, and results are looked for which will compare favorably with European boats of similar displacement. A sea speed of 23 knots and absolute directive force in her torpedoes will place this boat on a footing not yet surpassed by any.

Owing to the limited draught of water which torpedo boats in general are given, and the amount of coal, machinery, armament, and stores that they are necessarily forced to carry, the limiting points of stability are frequently disregarded. This result of overloading has undoubtedly been the cause of the numerous accidents which have placed so many torpedo boats *hors de combat* when sea maneuvers have been attempted on a large scale, and to which may be attributed the recent loss of torpedo boats by capsizing.

In order to insure better results in the development of the sea-going class of torpedo boats, it would be well to enter more fully into the conditions surrounding their stability and curves of the total weight and lading, while considering the stresses produced upon the structural strength of the light material of which their hulls must necessarily be constructed.*

This is but the entrance to a larger field of development in our torpedo service, which must necessarily be composed of torpedo boats of greater displacement, capable of cruising off the entire length of our coast in all kinds of weather, and protected against the fire of machine guns while making an attack in a seaway.

BLUE soap, rendering the employment of bluing in laundry work unnecessary, is made by incorporating with ordinary soap a solution of aniline green in strong acetic acid. By the action of the alkali of the soap, the green is converted into blue, uniformly coloring the mass.

*See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 704 and 705.

IMPROVED LINOLEUM PRINTING MACHINE.

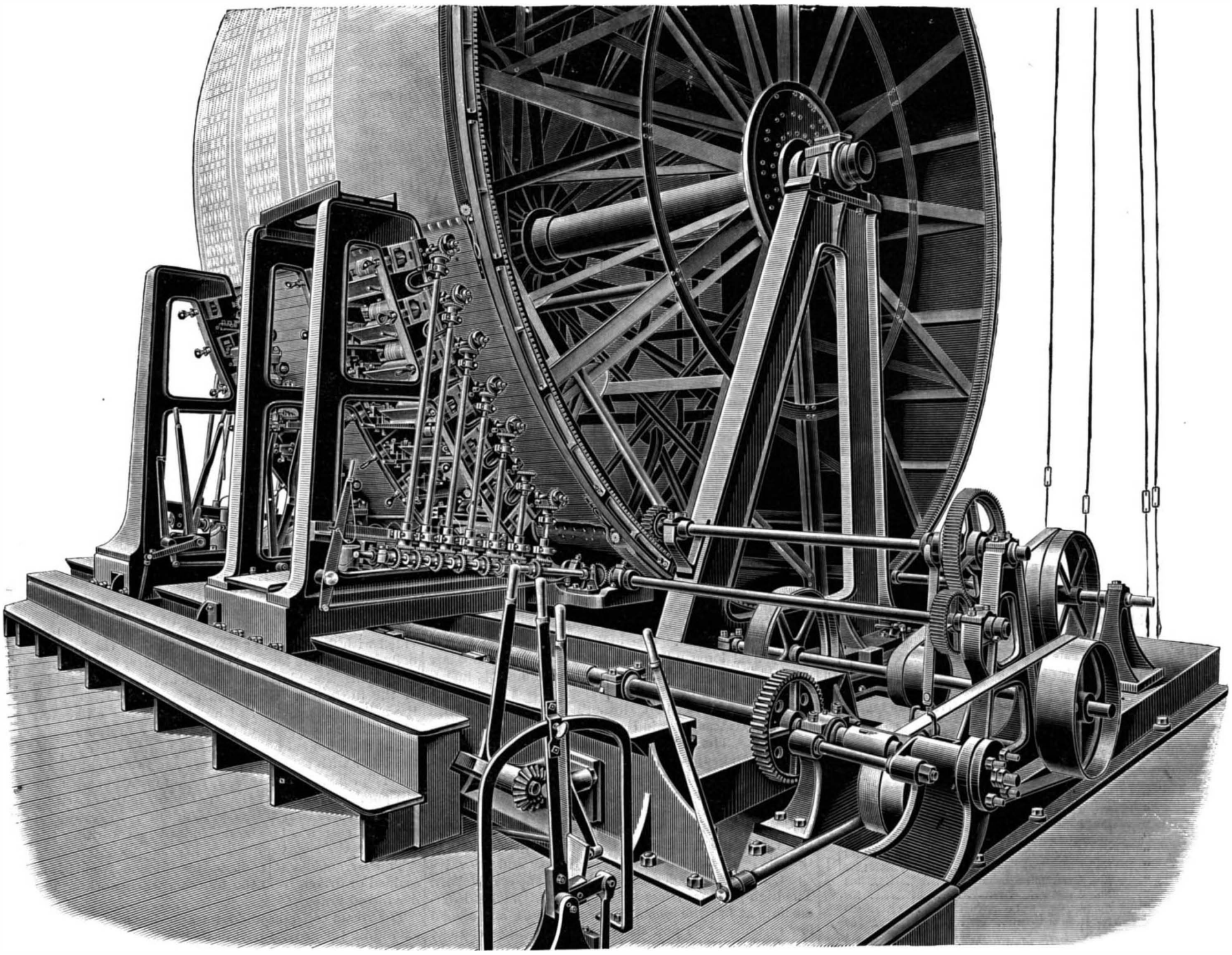
At Messrs. Barry, Ostlere & Co.'s, Edinburgh, the printing of the linoleum is done partly by hand and partly by a large multiple color printing machine, which is probably the largest printing machine in the world. We are indebted to *Engineering* for our engraving and the following particulars:

The machine has two drums, each 26 feet 9 inches in diameter, placed side by side, with a short interval between them, and each capable of being driven independently. Each drum is of sufficient size to carry a piece of linoleum 2 yards wide by 25 yards long, with a long gap between the ends of the piece when fixed upon the periphery of the drum. Parallel with the axis of the drums is a heavy bed, like that of a planing machine, and on this traverses a table carrying the framing on which the printing rollers are mounted, there being one roller for each color in the pattern. The rollers are but 1 foot 6 inches wide, and they therefore print but one-fourth of the width of the piece of linoleum at each revolution of the drums, and each roller is adjusted at such a distance below that next above it that the color it applies falls properly into its place in the pattern printed by the first roller. When a strip 1 foot 6 inches wide has been printed in this way the full length of a piece of linoleum, the drum is stopped automatically with the gap (which we have mentioned as existing between the ends of the piece) opposite the printing rollers. The frame carrying the latter is then shifted 1 foot 6 inches laterally, the drum again started, and a second 1 foot 6 inches width printed, and a third and fourth similar operation complete the printing over the 2 yard width. While a piece of linoleum is being thus printed on one drum, the adjacent drum is stripped of the piece last printed, and is covered with a fresh piece ready to be operated upon by the printing rollers. In this way the latter are kept steadily at work, the two drums being used alternately. The machine prints with excellent register, and all its details are well worked out. Each drum is driven by an independent Willans high speed engine.

The above description of No. 1 machine also applies to No. 2 machine, with the exception of certain improvements and additions, the most important of which is the addition on the front bed of another carriage carrying a complete set of color rollers for border printing. The drum of this No. 2 machine is 26 feet 8 inches in diameter and 12 feet 9 inches broad, and it has one drum instead of two, mounted side by side, as in No. 1 machine.

No. 2 machine is arranged to print seven colors, both in bordering and filling in. The machine will print and border widths from ½ yard wide to 4 yards wide by 25 yards long, and piece goods from 2 yards to 4 yards wide. The whole of the spur gearing connected with the transfer of motion from the drum to the printing rollers, including the internal segmented wheel bolted to the drum itself, is machine cut, thus insuring the greatest accuracy in the work turned out.

This machine has now been at work some time, and gives great satisfaction to its owners, while the design and workmanship reflect the greatest credit not only upon Mr. J. Wright, the inventor and patentee, but also upon the makers, Messrs. J. Copeland & Co.



IMPROVED LINOLEUM PRINTING MACHINE.

Locomotive Works Wanted in Australia.

The government of New South Wales offer to give any firm an order for 100 locomotives to be supplied within the next three years, subject to the following conditions: Rolling stock factory capable of building locomotives "equal in every respect to those made by the best English makers" to be established in the colony. The price of the locomotives must not "materially exceed" those of similar pattern built by first-class English makers delivered in steam in Sydney. The manager, or managing director, must be resident, and be "a locomotive builder of known repute." The estimated capital required to establish such works is £125,000.

ARGENTINE RAILROADS.—The following data have been received by the government of the Argentine Republic from its engineering department regarding the construction of railroads in the republic: Railroads in operation, 7,851 kilometers in the year 1889, against 5,963 kilometers in 1886; under construction, 5,057 kilometers in 1889, against 915 kilometers in 1886.

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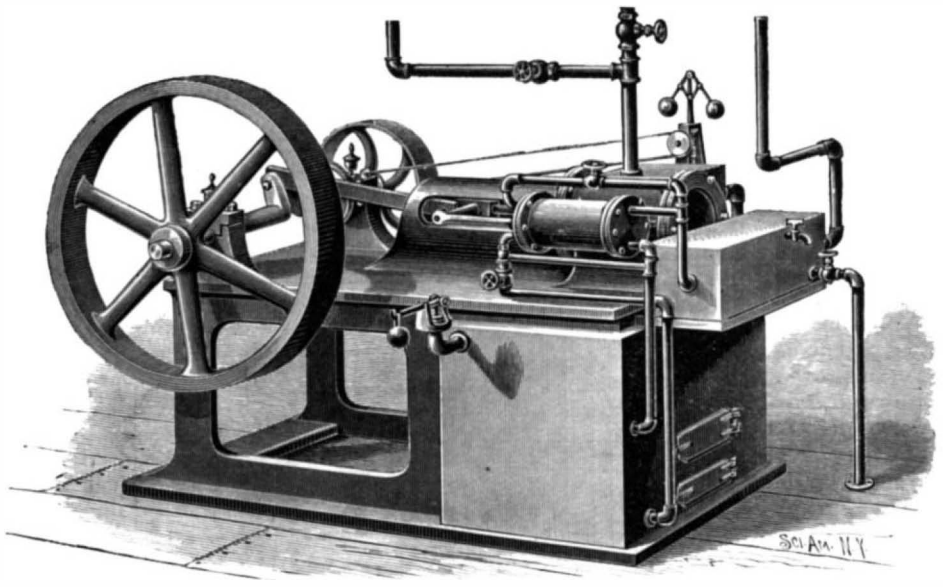
AN IMPROVED HOT AIR ENGINE.

The accompanying illustration represents an engine connected with a hot air reservoir, under which is located a heater and a furnace for heating it, while an air compressor operated from the engine is adapted to discharge into the furnace and into the heater. It has been patented by Mr. Jerome H. Chase, of Buffalo, N. Y. The hot air chest is held on the opposite side of the engine cylinder to that shown in the illustration, and into the hot air chest leads a valved pipe connecting with the upper end of the hot air reservoir, the heater and furnace below being inclosed in a single casing directly under the engine cylinder. The hot air reservoir has a number of longitudinally extending parallel plates passing through its bottom to the bottom of the heater, which forms the top of the furnace, the plates terminating a short distance from each and the top of the casing. Into the front end of the heater opens a pipe which connects by a discharge valve with one end of the air compressor, beside the engine cylinder, and the other end of the air compressor is connected by a valved pipe with the ash pit of the furnace, these two pipes being connected with each other by another valved pipe. The cylinder of the air compressor has the usual piston, and its piston rod is connected at its outer end with the crosshead of the engine, there being in the heads of the cylinder of the air compressor inlet valves, pipes from which admit air from a pipe extending downward into a closed reservoir in which is a cooler, arranged on the outer end of the engine cylinder. This cooler has a water inlet pipe connected with a suitable source of water supply, there being a faucet in its top for discharging heated water. The cylinder of the engine discharges into an outlet pipe leading to the outside, and having a valve below which is connected a pipe by means of which the heated air may be discharged into a room to be heated. The air in the hot air reservoir is rapidly heated by radiation from the plates and the heat from the furnace, when a fire is started in the latter, until sufficient pressure is obtained to move the piston of the engine cylinder, this motion then operating the air compressor, when pure air is drawn in and cooled by being passed through the cooler, this air being discharged by one pipe into the heater and by another pipe under the grate bars. The smoke and gases from the furnace are carried off through a suitable chimney connection, the air supplied thereto from the compressor being readily cut off when desired. This engine is double-acting, and by means of the pipes and their valves connecting with the air compressor the air-pumping capacity of the engine is placed entirely under control of the operator, whereby the power may be increased or diminished as desired.



CHASE'S HOT AIR ENGINE.

102 Years Old.

Captain Jack Haynes, the engineer in charge of the elevator engine at the Fagan building, is 102 years old. As he stood in front of the structure the other morning no one would have placed his age at over sixty-five years, and there would even have been some misgivings as to his being quite that venerable. Nevertheless, it was in 1787 that the old engineer came into this world, his birthplace being in the then wild and unsettled region of Tennessee. Like nearly all Tennesseans, the centenarian is a six-footer, chews tobacco, and loves a good story. He is active, healthy, spare in figure and only slightly bent with his wonderful weight of years, and possesses the eyesight of a frontiersman. —*St. Louis Republic.*

IN the article on a bicycle brake, Mr. J. J. Astor, Jr.'s, address was incorrectly stated in last week's issue. It should read 23 West 26th Street, New York City.

Insects in Drugs.

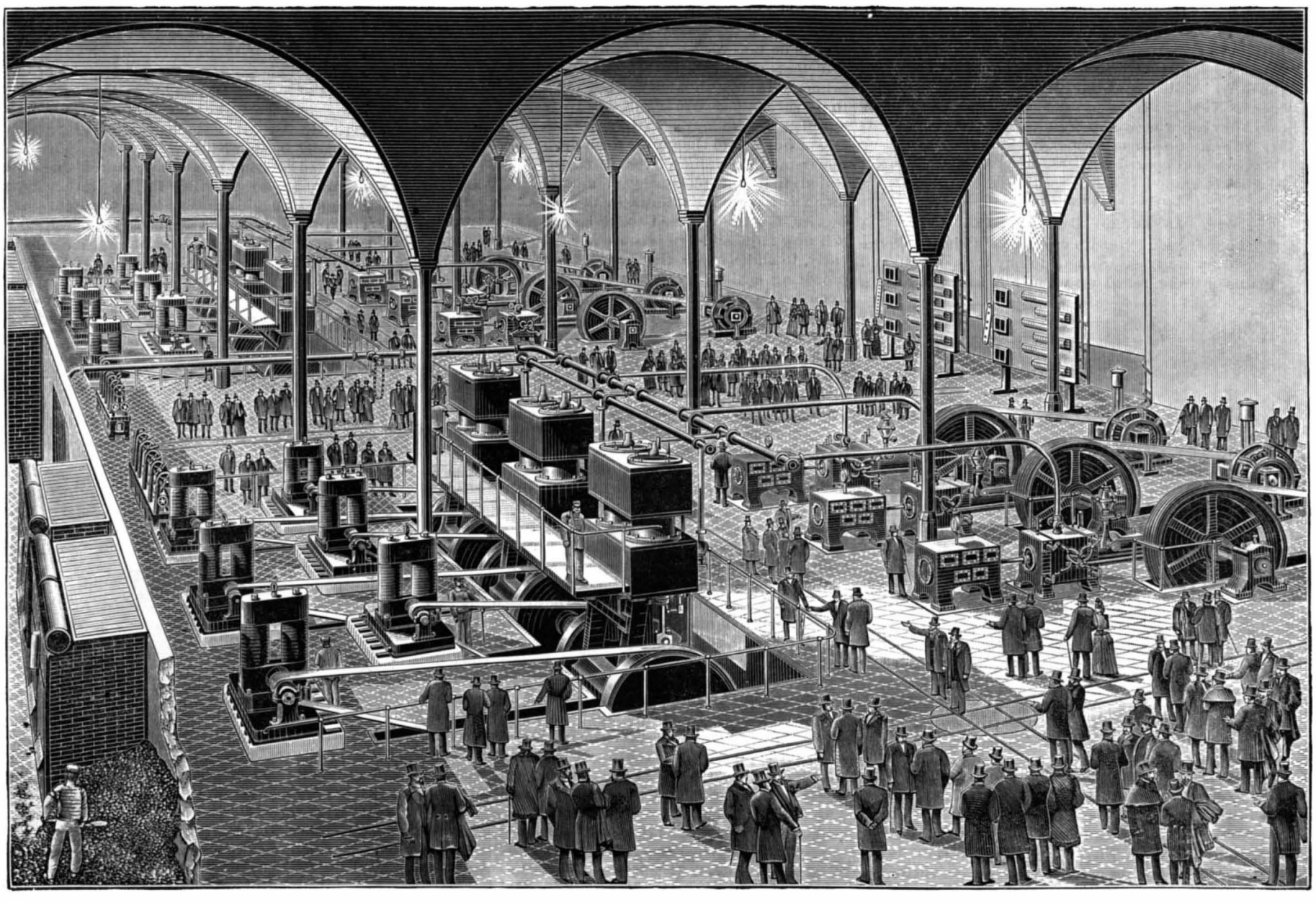
At a recent meeting of the Chemists' Assistants' Association, Mr. C. J. Strother showed a number of drugs infected with animal life, and remarked that the first, a fair-looking sample of crushed linseed, supplied about three weeks before by a large wholesale firm and kept in a wooden cask with a cover of wood, was seen under a lens to be literally alive. The next was aconite root, of which the parasite was quite different. Nux vomica and cantharides were the remaining specimens. With the last named it is usual to put camphor, though with doubtful effect, but it is possible that washing hard substances in a solution of salicylic acid, and quickly drying them, might protect them. The question naturally arises, What would be the effect of a poultice containing thousands of insects applied to an open wound, especially if the poultice be made with hot instead of boiling water ?—*Pharm. Jour.*

AN illustration in the *Photographische Mittheilungen* serves to point out a rather curious fact in instantaneous photography. The illustration given is that of a photograph of a passing bicyclist, in which the time of exposure was evidently too long. The image was, as a necessary consequence, blurred—all except the spokes in the *lower* portion of each wheel, which came out comparatively distinct. It would be interesting to know if readers of the *Journal* have noticed anything similar.—*Br. Jour.*

[Photos like the above are often seen. The reason why the spokes in the lower portion are distinct while the upper spokes are blurred is because the lower portion of the wheel moves slower than the upper portion. In all wheeled vehicles running along on the ground, the upper parts of the wheels have a much higher velocity than the lower parts of the wheels.—ED. SCI. AM.]

ELECTRICAL MACHINE ROOM OF THE HALLES-CENTRALES, PARIS.

Our engraving shows a view of a part of the great machine room of the municipal central station at the Halles-Centrales, Paris. It is one of the most complete and effective electrical establishments on the Continent. We are indebted to *L'Illustration* for our engraving.



ELECTRICAL MACHINE ROOM OF THE HALLES-CENTRALES, PARIS.

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Plant Labels.

A correspondent of *Garden and Forest*, writing from London, says a perfect plant label is still a desideratum there, as well as in America. Mr. R. T. Jackson's paper on "Method of Labeling Trees and Plants," read before the Massachusetts Horticultural Society last year, is interesting and suggestive. In it Mr. Jackson appears to have come near to what we have found the most useful label at Kew, both for indoor and outdoor plants. For temporary labels, such as are used for annuals and small nursery stock, there is nothing better than wood; but for permanent labels intended for collection plants, something more durable than wood is required, and the best material appears to be zinc. Iron, tin, slate, porcelain, and teak have been and are still in use at Kew; but on the whole they are not as satisfactory as zinc. As Mr. Jackson says, zinc "is reasonably imperishable, cheap, and very easily handled." The chemical ink recommended for writing upon polished zinc, namely, a solution of chloride of platinum, or chloride of copper, or other patent mixtures of a similar nature, have not, however, proved a success, no matter how applied. Varnish rubbed over the face of the label after the ink has dried preserves it from oxidation for a year or so, but as a rule the names are almost unreadable after a year's exposure outside.

An improvement on this ink is the use of enamel paint, applied as follows: The labels are cleaned with emery paper and then coated on the face with white enamel paint. This is allowed to get quite dry, and then over it is painted a coat of black enamel paint. The writing must be done while the black paint is wet, using for the purpose a pointed stick, such as a bit of bamboo shaped like a pen. In writing, the black paint is simply removed by the point of the stick. With a little practice the letters are as easily and clearly formed as if with pencil on white paint. The label should be thoroughly dried before being exposed to moisture. For trees and shrubs such as the labels can hang upon, the form preferred is a piece of zinc from three to four inches square, half an inch at the top to be bent over at an acute angle to afford protection from the weather. One or two holes should be made near the top, for wire or nails. For pots and herbaceous plants strips six or eight inches long, and shaped like the ordinary "tally," are best. These are easily cut out of a sheet of zinc with a pair of strong scissors. Labels thus prepared have been used at Kew two years, and they are as perfect now as when they were first written.

In the tropical houses, where the atmosphere is saturated all the year round, these labels are quite as good as in a dry house or out of doors. The first experiment with them was made with the filmy ferns, for which durable and neat labels were much wanted. They have stood this test. In appearance these labels are all that need be desired. They are not too conspicuous, and therefore do not offend the eye as white labels do. On the other hand they are easily read. In public gardens, such as Kew, labels are of considerable importance, as also they are wherever valuable collections of plants are grown. So far as our experience goes, this zinc label, when prepared as here directed, comes nearest to what is wanted.

AN IMPROVED HEAD REST.

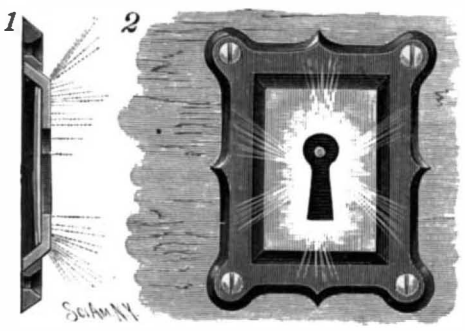
The illustration herewith represents a simple device adapted for ready attachment to any form of seat, and capable of being rolled up when not in use to form a

ANDERSON & HOPE'S HEAD REST.

small parcel. It has been patented by Messrs. John B. Anderson and John H. Hope, of No. 226 York Street, Hamilton, Ontario, Canada. The body of this head rest consists of two side pieces, each made in two sections and hinged together, the opposed sections being connected by a strip of canvas, so as to leave uncovered a central space between the side pieces. To the back of the upper section of the side pieces a block or bracket is secured, these blocks having each a recess in its inner face and a transverse slot, the side pieces being held apart by a curved transverse brace bar, whose ends enter the slots of the bracket blocks. In connection with the device two spring clamps are employed, preferably made of stout spring wire bent upon itself to form a loop, and when the device is in use the back of the occupant of the seat rests against the fabric uniting the lower side sections of the frame, the occupant assuming an easy reclining position by resting the head against the upper strip of fabric connecting the upper side sections of the frame.

A LUMINOUS KEYHOLE ESCUTCHEON.

The accompanying illustration represents, in perspective and vertical section, an escutcheon for keyholes, designed to be especially convenient on closets, chests, etc., in dark places. It has been patented by



FISH'S KEYHOLE ESCUTCHEON.

Mr. John E. Fish, of Albuquerque, New Mexico. The escutcheon proper, having the keyhole, is formed with glass, and has a concave or recessed back, to which is applied a coat of phosphorescent paint; this paint being covered with a coat of cheaper or ordinary paint. This escutcheon may be carried by an ornamental metal or other plate, secured to the door or other surface in the ordinary way, the shape of the escutcheon protecting the phosphorescent paint from abrasion and moisture.

The Epidemic of Influenza in St. Petersburg.

During the last three or four weeks an epidemic of influenza, which has assumed serious proportions, has been raging in St. Petersburg and some of the suburbs and neighboring towns—Peterhof, Gatchino, and Cronstadt among others suffering severely, while up to the date of the last information Tsarskoe Selo had escaped. In the schools of all grades from a quarter to a half of the pupils and teachers have been absent, the military hospitals, too, are so crowded that many of the men have to be treated in the barrack rooms, and the ordinary drill is seriously interfered with. Business is carried on but very partially, owing to the number of principals and employes who are laid up. The medical men—that is, those of them who are so fortunate as to have escaped—are "run off their legs," and the chemists are doing a thriving trade, chiefly in the sale of quinine to the public, who have largely come to understand the value of that drug in influenza. It is stated that one pharmacy of moderate size sold as much as a pound of quinine in two days. Dried raspberries, too, are reported to be so much in favor that it is now impossible to procure any. In order, apparently, to make up to the public for the difficulty of procuring medical attendance, the lay press has taken upon itself to instruct the uninitiated in the medical aspects of influenza. Thus, one of the first of the daily journals gravely states that influenza is liable to be complicated with pleurisy, eczema, bronchitis, pulmonary phthisis, nephritis, otitis, catarrhal pneumonia, vaginitis, scabies, lymphadenitis, and soft chancre!

It is impossible to say how far the affection has spread by actual contagion. In some families only one member has been attacked, while in others every member has succumbed one after another. The period of incubation appears to be two days, and that of invasion a few hours only. This is marked by lassitude, headache, and rigors, and is followed by great prostration, weakness, articular pains, headache, and sometimes by giddiness or various nervous phenomena, such as hyperæsthesia. The temperature rises rapidly, it may be almost as high as 105°, but generally falls quickly, seldom remaining high more than from one to three days. So far as appears at present, there is always some slight enlargement of the spleen to be detected. Three main types of the disease have been distinguished—the purely neurotic, the catarrhal, and the gastric. Cases corresponding to the purely neurotic type are marked by severe neuralgic pains, which might be supposed to betoken the commencement of an attack of pleurisy, while the mucous membrane of the respiratory and digestive tracts is quite unaffected. This form has been very common, and has been at the commencement mistaken for typhoid. In the catarrhal form there is bronchial catarrh, running at the nose, and conjunctivitis, which may either come on simultaneously with the fever or after this has gone down, and which usually last for several days after the temperature has become normal. In the gastric form there is sometimes severe vomiting, lasting for one or two days. With regard to complications which have been noted as occurring during the present epidemic, herpes of the lip and nose has been very frequent, and sometimes has been seen on the eyelids; erythema, roseola, and urticaria have also been seen, meningitic irritation, and catarrhal pneumonia, too, are mentioned. The last named complication has been the cause of the few deaths that have taken place. Many of the cases, on the other hand, have been very slight. Some relapses are reported as having occurred from five to seven days after convalescence. They were marked by a rise of temperature, rigors, and catarrh. The drugs most generally employed are quinine, acetanilide (of which 7½ grain doses are ordered two or three times daily), antipyrin, salicylate of soda, and diaphoretics, which have proved very successful.

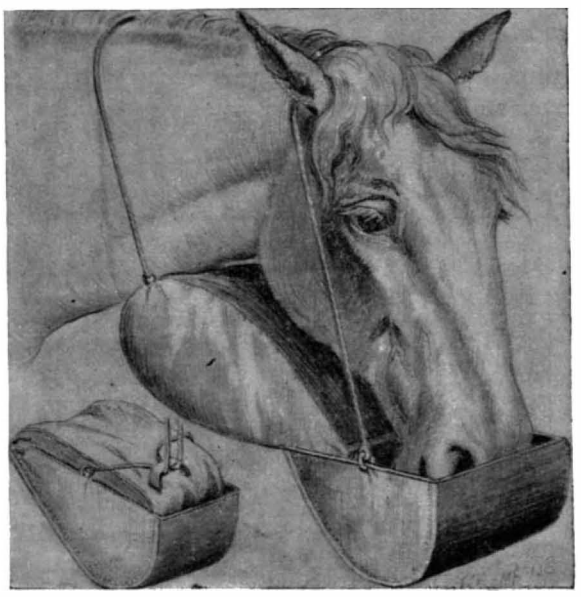
It may be remarked that owing to the frequency and severity of epidemics in Russia the disease has acquired the name of "Russian catarrh."—*London Lancet.*

A New Water Power Developing Device.

At the Buffalo, N. Y., International Fair, recently held, a gold medal was awarded Mr. M. Maginn, a mechanical engineer, of Chicago, for his model of a device for utilizing the water power of Niagara Falls. The invention was illustrated and described in the SCIENTIFIC AMERICAN of February 9, 1889, the model, as shown, being operated by means of a strong stream of water directed straight downward from a steam pump. This stream was directed upon a water wheel operating upon a movable traveling frame mounted on friction wheels and carrying electric generators or dynamos driven by the motor. The model is said to have well represented the inventor's ideas, and to have attracted much attention.

AN IMPROVED FEED BAG.

The accompanying illustration represents a feed bag having a storage compartment, and means whereby the grain or other food contained in it may be automatically fed in such quantities as desired. A perfect circulation over the food in the feeding compartment is also provided for. This invention has been patented by Mr. Charles R. Monfort, of No. 212 St. Nicholas Avenue, New York City. The body of the bag, which is ordinarily of canvas, consists of two side pieces with a convexed lower edge and a straight upper edge, the bottom, which also forms the front, being a stout piece of suitably curved leather. The storage receptacle is fastened to the rear end of the leather bottom, and is preferably made of a single strip of canvas. The rear ends of the side pieces of the body are attached to the outer face of the sides of the storage receptacle, there being an opening from the latter to the feeding compartment, with a gate for regulating or stopping the flow of feed. This gate consists of a square of canvas hinged to the receptacle, and of sufficient length and width to touch the sides and bottom of the feeding compartment, this canvas being stiffened by a strip of longitudinally bowed leather or metal. The gate is held in locked position by a strap secured thereto and passed through an aperture in the leather bottom and through a buckle or other form of catch. At the rear end of the storage receptacle is a strap in loop form adapted to be passed over the animal's neck, to hold the receptacle back of the jaw, and another strap,



MONFORT'S FEED BAG.

passing over the head and back of the ears, holds the feeding receptacle around the nose. The amount of flow of feed into the feeding compartment is determined by the adjustment of the gate strap, the movement of the animal's jaw in feeding giving enough motion to the storage receptacle to cause a continuous supply to be fed therefrom to the feeding compartment.

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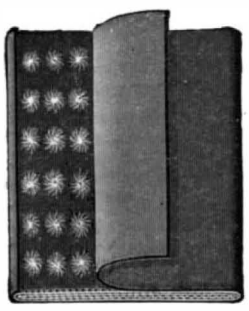
THE MONARCH RUBBER BELTING.

India rubber belting made upon a canvas basis has won extensive popularity among manufacturers. In the cut we illustrate a recent improvement that places the Monarch belting, embodying it, well in advance among its strongest competitors. Hitherto the different layers of a belt have been connected by the India rubber, and in some cases additional re-enforcement is provided by longitudinal sewing. The latter is found to be an advantage, but is defective. As the belt stretches in service the thread will break, and its effects as regards the holding the layers together are then nullified. In the Monarch belt the plies are coated with India rubber, and are pressed together and united by longitudinal rows of cotton cord stays or flexible rivets. The cord is cut as inserted so as to project about one-fourth of an inch on both sides of the belt. The rubber coating covers the projecting ends, and after pressure the outer covering is applied and the whole is vulcanized.

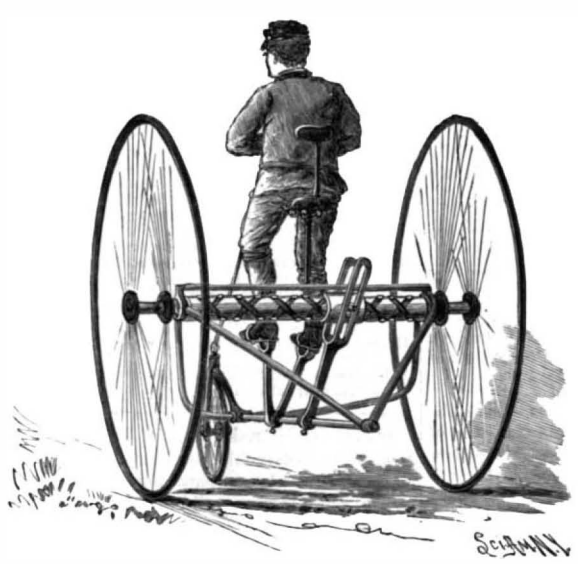


In this way the layers are permanently connected, and remain so through all longitudinal stretching to which they may be subjected. The belt is recommended where unusual strength and durability is required.

For further particulars the reader is referred to the Gutta Percha and Rubber Manufacturing Co., corner Warren and Church Streets, New York City, N. Y.

AN IMPROVED TRICYCLE.

A tricycle designed to be operated with but little friction, and to be propelled at a high rate of speed with comparatively little exertion, is illustrated herewith, and has been patented in this country and England by Mr. Francis W. Pool, of No. 57 East Tenth Street, St. Paul, Minn. The axle, journaled in the side pieces of the frame, is provided with continuous circumferential right and left spiral grooves, and a traveling sleeve is held to slide thereon, the sleeve consisting of a shell in which two abutting rings are loosely held, the inner surface of each ring having a spiral lug, one traveling in the right hand spiral groove of the axle and the other in the left hand spiral groove, the outer edges of the rings being toothed to engage contiguous toothed surfaces of rings rigidly held one at each end of the shell. The sleeve is reciprocated from a rock shaft journaled in the lower aligning ends of the main frame through the medium of a vertical shaft whose lower end is rigidly attached to the rock shaft, the upper end of the vertical shaft being forked, and its members extending up one at each side of the sleeve. The arrangement is such that when the rock shaft is carried to the left by pressure upon the left hand pedal, the fixed ring meshing with the loose ring in the sleeve causes the spiral lug to travel in the right hand groove, turning the axle and the wheels. When the rock shaft is thrown to the right, by pressure upon the other pedal, the loose ring is released and the opposing central ring engaged with the other fixed ring, causing the lug of the sleeve to revolve in the left hand groove and rotate the axle continuously in the same direction. The machine is a front steerer, designed to be conveniently manipulated, and of a simple and durable construction.



POOL'S TRICYCLE.

Electrical Industries, of Chicago, the newest comer into the electrical field, has, as a permanent feature, a complete directory of the electrical trades, a compilation requiring much labor and care. Besides this, it contains a large amount of original and carefully prepared matter, interesting to the general student as well as to the electrician.

A Serious Reflection.

The following paragraph has been given a wide circulation:

Of the 1,060 men in the Eastern Penitentiary of Pennsylvania, only nineteen were bred mechanics, a fact which shows that men who were trained to work seldom become criminals.

There is no question but that not only mechanical employment, but all kinds of labor, manual or mental, lessen not only crime, but sickness as well. And yet the ironclad regulations of most of the labor unions render it almost impossible for a young man to secure employment as an apprentice to a trade. With a view of keeping up the price of labor by preventing too many learning the various mechanical industries, many worthy lads are allowed to grow up in idleness, or seek employment for which they have no taste, and hence no hope of succeeding. Yet skilled labor is constantly coming into the country from foreign countries and filling positions that our own children, if better opportunity for acquiring a knowledge of these industries had been afforded, would have filled quite as well.

Because of this organized effort to prevent entrance to the various trades through apprenticeship, we are strongly in favor of public and private industrial schools—schools where the best facilities and opportunities for thorough practical training can be had. We believe one of the greatest dangers to society, and one affecting the economic life of our country most seriously, is the great tendency of young men to crowd into the professions rather than the industrial occupations. We believe it would be infinitely better to educate the hand, as well as the head, and most young men and women would be better in after life, physically as well as mentally, with a thorough knowledge of some trade.

At these industrial schools not only architecture and civil and mechanical engineering should be taught, but carpentering, brick and stone masonry, moulding, plastering, cooking, and all branches of housework, together with agriculture, horticulture, etc. The head and the hand could be educated contemporaneously, the course of study being adapted to the particular mechanical occupation to be followed. Such a course would not interfere with a thorough, high grade, classical course for those entering professions.

We are well aware that theoretically, perhaps practically, such an industrial course is designed for our agricultural schools, and that but comparatively few avail themselves of it. Such a course is not popular. Our object in writing this article is, if possible, to help what we can to popularize such industrial studies. We were "brought up" in a foundry, and early taught to "ram sand." We would not now, if we could, part with our practical knowledge of that industry for a great deal. We believe we are wiser, stronger, and better for it. Thus writes Dr. J. F. Kennedy, editor of the monthly *Bulletin*, Iowa State Board of Health.

The Pull on a Street Car Cable.

The following record of a street cable that recently wore out its life doing duty on the California Street road will be read with interest. It was first published in the *Pacific Lumberman:*

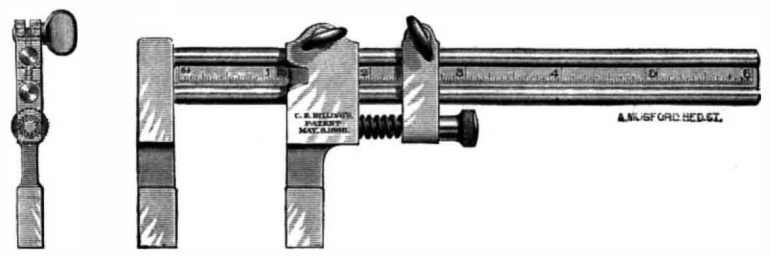
The diameter of the cable when laid was one inch and a quarter, but twenty months of constant hauling and wear over the pulleys and through the grip thinned it down one-eighth of an inch. Its length was 17,513 feet and its weight 44,604 pounds. For nineteen hours a day it kept moving every day for twenty months, and as its speed was seven miles an hour, the distance it traveled was 79,800 miles. It transported about 6,000,000 passengers, or about six times the population of the State, and turned over to the company $300,000 worth of nickels, being at the rate of $15,000 a month, or $500 a day. As the total power of the road was 400 horse power, it may be calculated this rope was doing as much hauling while in motion as 200 horses, and as each car hauled by horses uses four teams a day, the daily work of this cable was equal to that of 800 horses, with a deduction, however, for the great power required to move 44,604 pounds of cable. The cable was composed of six strands of steel wire cables, each one containing 19 wires, varying in size from six to eight wire gauge, and twisted around a stout hempen core five-eighths of an inch in diameter.

A GUM CONTRACT.—The French post office department has received tenders for the next year's supply of gum arabic needed in the manufacture of postage stamps. The specifications called for 40,000 kilos., or about 40 tons. The department began making its own stamps in 1875, when the total issue was about 700,000,000. For 1890 the estimated number will be 3,000,000,000, of which only 7,500,000 are for Monaco, Tunis, and the colonies. Last year 169f. the 100 kilos. —say 17 cents per pound—was the price contracted for. This year, if the sealed proposals have been opened, the results have not yet been published.

NEW BEAM CALIPER.

We give an engraving of a beam caliper which is a great improvement upon its predecessors. The scale, which is graduated to 64ths upon one side and upon the other to 100ths of an inch, is protected by the rods which are attached to its edges. These rods also stiffen the beam of the caliper, so that it is not liable to spring under the conditions of use. One of the jaws is fixed to the head of the beam. The other is adjustable by a screw swiveled in a clamping block.

The movable jaw and clamping block are split and provided with thumb screws, so as to be capable of being clamped at any point along the length of the beam. The screw adjustment of the movable jaw is rendered very sensitive by the interposition of a spring between the jaw and the clamping blocks. The jaws are made perfectly true by grinding. The graduations are accurate, and the tool is finely finished.



BILLINGS' BEAM CALIPER.

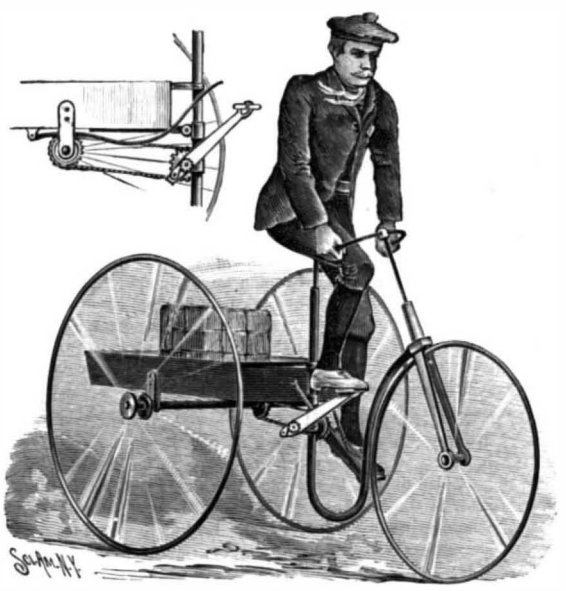
The Billings & Spencer Co., of Hartford, Conn., are the manufacturers of this instrument.

The Value of Vaccination.

"After moving from this place ten days passed before we reached another plantation, during which time we lost more men than we had lost between Banalya and Ugarrowwa's. The small pox broke out among the Manyema and their followers, and the mortality was terrible. Our Zanzibaris escaped this pest, however, owing to the vaccination they had undergone on board the Madura." The foregoing is an extract from the interesting letter of Mr. Stanley published this week, and we commend it to the notice of the anti-vaccinationists.—*Lancet.*

AN IMPROVED VELOCIPEDE.

A velocipede having supports to accommodate a wagon body, and designed to be an easy-riding machine, with the driving mechanism arranged to facilitate its propulsion up steep grades, is shown in the accompanying illustration, and has been patented by Mr. Allen M. Stoner, 616 Monroe st., Topeka, Kansas, the small figure being a side view of the working parts. The forward end of the wagon body, carried by supports from the rear axle, is supported by the reach or backbone, the outer end of which has a socket through which the shank of the forward wheel fork extends, the upper end of the shank having the usual steering bar. The rear end of the backbone is socketed to receive the standard of the seat or saddle. Upon the rear vertical portion of the backbone is a sleeve which supports a shaft carrying a chain wheel and two rigidly mounted ratchets, the pedal levers being mounted within the latter, and carrying gravity pawls arranged to engage the ratchets. In connection with each of the pedal levers is mounted a spring, of such tension that the levers may be easily depressed by the rider. Upon the chain wheel is a driving chain which engages a chain wheel rigidly mounted on the main axle, whereby motion is communicated to the latter. To obviate the disagreeable noise made by the slipping of the pawls over the ratchet teeth, each of the pawls is provided with a rubber plug, while a brake lever is pivotally connected to the wagon body with a shoe which may be brought to bear upon a disk rigidly connected to the main axle.



STONER'S VELOCIPEDE.

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RECENTLY PATENTED INVENTIONS.

Engineering.

HYDROCARBON BURNER. — David C. Andrews and James F. Seery, New York City. This burner has a body portion having a vaporizing chamber and a mixing chamber, two concentrically arranged nozzles discharging into the mixing chamber, a pipe supplying hydrocarbons or gases to one nozzle, while compressed air is supplied to the vaporizing chamber, with other novel features, the apparatus being applicable for heating purposes in working furnaces of all kinds.

STEAM ENGINE INDICATOR. — Edwin Garst, Dayton, Ohio. Combined with the steam chest and cylinder is a balancing beam, and separate and independent operating connections between the beam and the chest and cylinder, with a marker operated by the beam, and other novel features, the device being self-adjusting to any pressure of steam, and actuated entirely by steam, thus avoiding all springs.

Electrical.

ELECTRIC RAILROAD TELEGRAPH.—Baylus Cade, Louisburg, N. C. This telegraph is made by a peculiar arrangement of circuits, sliding contacts, and electro-magnets upon the train and at the various stations, operating upon the block system, to prevent one train from entering on a given section of track until the preceding train has passed off, and adapted to permit one moving train to communicate telegraphically with another or all the trains that may be upon the road.

ELECTRIC RAILROAD. — Baylus Cade, Louisburg, N. C. This invention relates to electric railroads in which the car is suspended from a single overhead rail, the invention covering a peculiar construction and arrangement of the circuit wires or conductors in sections, in connection with a local battery and circuit for each section, and the contact surfaces of the cars.

ELECTRIC STREET RAILWAY. — Bernard J. Black and Wilton F. Jenkins, Richmond, Va. This invention relates more particularly to a trolley detachably connected with the car body, and which leads the current from the wire in the conduit to the motor on the car body, the invention providing means for supporting the trolley upon the car body in such manner as to admit of vertical, longitudinal, and transverse movement, to adapt itself to any unevenness of the conduit wire or irregularities of the conduit slot.

CONDUIT FOR ELECTRIC RAILWAYS.—Bernard J. Black, Richmond, Va. This invention provides a conduit of strong and durable character, with detachable covers to admit of ready access to the interior, and so constructed that but a minimum of water can enter the conduit, and in which the circuit wires are disposed within the conduit to one side of the slot.

Railway Appliances.

DEVICE FOR TRANSMITTING POWER.—Arthur von Babo, Seattle, Washington. This is a device especially adapted for use in connection with cable traction railways, where there is but one cable operating in a street, and provides means whereby reversible motions for a wheeled vehicle may be obtained from a continuous running cable, the reversing device being also quickly turned into a simple and effective gripping device.

ICE PLOW. — Edward Leslie, Orangeville, Ontario, Canada. This is a plow and flanger specially adapted for loosening the hardened snow or ice on the insides of the rails and removing the loose snow and ice from between the track rails, and is arranged to be raised and lowered simultaneously and automatically when the plow strikes an obstruction, such as a switch in the track, etc.

Mechanical.

FLUE CUTTER. — Gustav Bogusch, Vallecillo, Mexico, and August Zincke, Llano, Texas, administrator of Robert J. Bogusch, deceased. This cutter is constructed with a pair of pivoted arms having their shorter pivotal portions opening outward, with a lateral bearing block on one of the shorter pivotal portions and a cutter head on the other, and with a detachable arm, by means of which flues may be quickly and easily cut.

WRENCH.—William S. Hoskins, Brookhaven, Miss. This is a monkey wrench so designed that the adjustments of its movable jaw may be more quickly made, and also to enable the jaw and its bearing to be set upon or released from the adjusting screw at the will of the operator, and by such release to further expedite the adjustment of the jaw.

SAW SWAGING MACHINE. — Noah W. Mortorff, Jennings, Mich. Combined with a swage block having a longitudinally extending slot is an eccentric die mounted to turn in the block, an anvil die held adjustably in the block, an arm projecting from the block, and a spring-pressed tooth plate held on the arm, with a clamping device.

LOCK NUT. — Aaron C. Vaughan, Shane's Crossing, Ohio. This is an improvement in that form of nut lock in which a supplemental jam nut is applied to the threaded end of the bolt outside the ordinary nut, and consists of a plate with a central bolt hole and having its ends bent up at right angles to the body of the plate and threaded on their inner faces, in continuation of the threads of the bolt hole.

SEWING MACHINE PRESSER FOOT. — Ferdinand B. Almy, Providence, R. I. This is an improvement in that form of foot in which a movable spring-pressed section is attached to the foot, capable of descending to a lower level than the lower face of the foot proper, being designed mainly to secure a uniform blind seam, stitch, or hem with any thickness of material, and in which the stitches are allowed to show only on one side of the hem.

POLISHING TOOLS. — Frederic A. Palmer, Port Jervis, N. Y. This invention covers an apparatus for supplying abrading and polishing material or paste to brushes or tools used for cutting or polishing purposes, and more particularly to rotating brushes used in cutting and polishing glasswares.

TUG STRAP HOLDER FOR POWER LOOMS.—Patrick H. Lynch, Kenyon, R. I. This is a rigid and adjustable holder for the tug strap on the picker staff, but made of wood, so as not to cut the tug strap, and also of a different construction and applied to the back of the picker staff, thereby strengthening the latter.

HOSE WINDING MACHINE.—Joseph A. Coultaus, Brooklyn, N. Y. In this machine the wire-placing tool is made to revolve about the hose, the hose being fed forward through the tool without turning, the machine having a pair of wire-feeding rollers, a placing tool, and a mechanism whereby the rollers may be revolved each about its own axis, and both about the main axis of the machine, with which the wire-placing tool is concentric.

GRINDING MILL. — James S. Woodcock, New Lexington, Ohio. This is a mill which can be used either as an independent power for running other machinery or as a combined power for other machinery and a grinding mill, or as a grinding mill alone, the invention covering improvements on a former patented invention of the same inventor.

Agricultural.

COTTON SEED PLANTER.—Edward L. Harris, Red Banks, Miss. This invention provides a device whereby the seed or fertilizer carried may, at the pleasure of the operator, be delivered directly into the hill or furrow, or the flow of material may at any time be stopped, when moving to different parts of a farm or turning the end of a row.

Miscellaneous.

CRAYON. — Abraham Hart, Brooklyn, N. Y. This is a crayon designed for marking coarse and fine fabrics, of all kinds of materials, giving a well defined mark, while the crayon will not be affected by a warm temperature or the heat of the hand, the crayon being made of a pigment, stearic acid, and different kinds of wax.

CEILING BLOCK. — Albert E. White and Matthew W. Wragg, Brooklyn, N. Y. This invention covers a novel construction and combination of parts whereby the ceiling or walls of an apartment may be laid in the coldest weather, and the blocks be regularly, expeditiously, and conveniently placed and held in position.

DRIER CAR.—Phineas Arnold, Canal Dover, Ohio. This is a car adapted for use in connection with a kiln for purposes of support in the process of drying preparatory to burning brick, the construction being economical and durable, while the car is very light and exceedingly strong.

CLIPPING MACHINE.—John W. Eisenhuth, San Francisco, Cal. This invention is designed to simplify the construction of hair cutters or clippers and reduce the number of parts, providing also a machine adapted for heavy shearing, and one which can be readily manipulated by the operator, the invention being an improvement on former inventions of the same inventor.

DRAUGHT ANNUNCIATOR. — William Bulluck, Centralia, Pa. This is a device to indicate the state of air in the return airways of a mine, a fan wheel located therein being rotated by the current, the wheel being connected by suitable mechanism with a bell, which is sounded at intervals varying with the speed of the wheel, these sounds being transmitted by telephone to the central office above ground.

ROCK DRILL.—Marquis D. L. Windell, Corydon, Ind. This is a light-running portable drill in which the mechanism is contained in a tubular casing adapted for connection with a flexible shaft in communication with a motor, the invention covering a novel construction and arrangement of parts.

KILN. — John H. Johnson, Orange, Texas. This invention relates to an automatic heat-regulating apparatus for dry kilns, the mechanism opening and closing a valve controlling the admission of steam to the kiln, and also operating dampers in the dome of the kiln.

CARPET SWEEPER. — William H. Pickett, Warren, Pa. In connection with the sweeper case are arranged four supporting wheels, the brush cylinder being formed with extending trunnions, and at either side of this cylinder are mounted dust pans, the brush cylinder being forced more heavily against the carpet or floor, as desired, by bearing downward upon the handle.

HORSE BOOT. — Thomas B. Mason, Trenton, N. J. This a boot which is elastic and flexible except in the direction of its circumference, while its inner surface is interrupted to present a wearing surface formed of a series of pads, the boot not needing lining, and being designed to be lighter and cooler than the ordinary article, and less expensive.

MEASURING LIQUIDS. — Oscar Moller, Hamburg, Germany. This invention covers an apparatus for measuring and drawing off liquids from barrels and other storage vessels, and delivering the same in desired quantities to another vessel, the invention covering a novel construction, combination and arrangement of parts.

COUPLING FOR CARRIAGE POLES. — James M. Smith, Greenwich, Conn. This is an adjustable coupling consisting of a curved forging or casting having an eye at its outer extremity and a flat inner surface with longitudinal openings at each side of which are teeth, and an angled flange projecting upward from each side of the flat surface, the pole with this coupling being readily adapted for attachment to axles having thill ears at different distances apart.

CLAMP FOR TOBACCO CURING. — Ebenezer Talbot, Windsor Locks, Conn. This is a holder whereby the strips of wood on which the tobacco is hung may be held at a proper height by one end, so that one operator may quickly place the stalks of tobacco thereon by moving them endwise on the free end of the strip.

ADDING MACHINE.—William Siddall, Frontier, Mich. Combined with a drum having a series of ribs and a scale on its periphery is an indicator resting on the scale, pivoted and spring-pressed keys to which graduated levers are secured, graduated fingers being pivoted to the upper ends of the levers and adapted to engage the ribs of the drum, with other novel features, making a simple machine upon which a column of figures may be quickly and accurately added.

ICE PLOW.—Hamilton Pray, Clove, N. Y. This plow is so constructed that all the runners and blades are adjustable, and the relative positions of the front and rear runners with the cutting blades may always be retained, so that the plow cuts to regular depths at all times, and the animal is enabled to more readily draw it over the field with a steady, uniform pull.

GAS WASHER. — Manuel A. Piedra, Schriever, La. This invention relates to apparatus for washing the sulphur fumes used on sugar plantations for bleaching the cane juice previous to its conversion into sugar, the fumes being thereby thoroughly washed and conveyed cold to the cane juice, while the supply is regulated and the escape of the fumes prevented.

SACK DETACHER. — Lemuel Martin, Rickreall, Oregon. This is a box open at top and bottom, to be secured by hangers to a thrashing machine frame, or any place where sacks are to be filled with grain or other material, the box having a cross bar and pins in connection with a sliding frame and apertured stops, making a device which is simple and strong and cheaply made.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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(1771) G. M. asks: 1. Of what substance to make a capillary tube into which mercury will be attracted. Or of what substance to make a three-cornered box in which mercury will be attracted up at the narrow end, and not depressed, as in a glass box? A. There is no substance that will do this to any extent. A box of copper, gold, or other metal that amalgamates with it, will do it to a very slight extent, but will rapidly contaminate the mercury. 2. In what direction does the earth move around the sun, I mean its yearly motion, "say at sunrise, what direction is the earth moving in its yearly revolution"? A. In a general sense toward your antipodes; at midday toward the west. 3. Can the north and south polarities of a magnet be isolated from each other in any manner? A. No; they must co-exist. 4. Is there any railroad switch in use in which an open switch is an impossibility, that is one which leaves the main line so that a train could still pass over the open switch without becoming derailed?—a switch that would allow a train to take the side track, but still not open the main line to a train coming from the opposite direction on the main line. A. Such switches are in use. 5. Can zinc be soldered;

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if so, how? Have tried the usual way, as for tin, but failed. A. Use concentrated muriatic acid as the flux. The soldering takes but slight hold of the metal. 6. Will an uncharged glass jar become charged if it is slipped inside of a highly charged Leyden jar? A. No. 7. How are small bells made to ring for years by means of static electricity, and without any attention from any one? A. You doubtless allude to the dry pile described in all works on physics. 8. Supposing I touch the outside of a Leyden jar that is charged (but has no coating of foil, nothing but just the clear glass) with one finger of the right hand, and directly opposite of where my finger is, I place a finger of my left hand (inside of the jar), will the glass between my fingers be discharged, and if so, will that particular place become again charged after I remove both fingers? A. You will discharge it, and it will slowly become recharged, but the potential of the jar will be diminished to an extent dependent on its relative area.

(1772) W. S. H. writes: Henry White Warren, D.D., in his "Recreations in Astronomy," in speaking of the nebular hypothesis, says: "It is a very serious difficulty that at least one satellite does not revolve in the right direction. How Neptune or Uranus could throw their moons backward from its equator is not easily accounted for. It is at least one Parthian arrow at the system. . . . A greater difficulty is presented by the recently discovered satelites of Mars. The inner one goes round the planet in one-third part of the time of the latter's revolution." Is the nebular hypothesis losing ground with scientists, or is it regarded as probably true? A. It would be a perfect hypothesis that had not a single exception in so vast a scheme as the solar system. The isolation of the outer planets, Uranus and Neptune, by the greatly increasing zones of distance from the central solar influence, may have involved their local systems in perturbation from the tramps of our stellar system, such as we observe in the comets and meteors that come within the limit of our observation. These may be the Parthian arrows that disturb perfect uniformity considering the immeasurable time since the hypothetical commencement of axial revolution in the outer planets, and the vast distance that the whole solar system has traveled through interstellar space since the fiat of creation began, it is wonderfully strange that the system is as perfect as it is. The aspect of the asteroids points strongly to disruption of a primary planet by impact of a wandering body at a far distant time in planetary history; it, therefore, is reasonable to refer the abnormal position of the orbits of the satellites of Uranus and Neptune to the same cause; causes for the wonderful velocity of the inner satellite of Mars may be safely refered to the relative values of gravity in Mars and its satellite as balanced by the centrifugal force due to the orbit of the satellite. The nebular hypothesis is not losing ground in its relation to gravitation, as the fundamental principle of aggregation and motion, but may become somewhat modified under the advancing discoveries favoring the corpuscular hypothesis.

(1773) M. E. asks for a receipt for liquefying solid extracts of opium, also gum opium. A. Water is sufficient, and is the menstruum prescribed by the U. S. Pharmacopœia. To make the liquid extract, one ounce of the solid extract is macerated in 16 ounces distilled water and 4 ounces rectified spirit (both imperial measure); filter. It should make up one imperial pint. The alcohol is used as a preservative only.

(1774) E. H. C. asks why gray hairs appear in a person's head before reaching the age of 22? And can you inform me of a remedy to bring the hair back to its color? A. No reason can be well assigned; habits of life may have brought it about. It may be hereditary. The color can only be restored by dyeing.

(1775) E. L. T. asks if there is any fulminate that will explode at 150° F., or if such a fulminate can be made. A. Such a fulminate can easily be made, but would be exceedingly dangerous, and liable to detonate under very minor disturbances. It would be difficult to indicate one which would explode at exactly that temperature, but it could be made the subject of an investigation.

(1776) B. C. H. writes: I have just come in possession of the plunge battery described on page 95 of Queen's Physical Catalogue, 6 cells, carbon plates 5½×2½, in pairs, with zinc between. Now will you be kind enough to give me: 1. The internal and external diameter, length, size of wire, etc., that will enable me to construct a coil that shall give the best effect in lifting, charging permanent bar magnets, etc.? A. The diameter of your coil will be governed entirely by the use to which it is to be applied. The smaller the diameter, the greater the number of turns for a given resistance. For your battery with the elements connected in series use No. 16 wire. With the cells connected in parallel use No. 12. Make the resistance of your coil equal to the resistance of your battery. 2. How should I connect (parallel or series) for strong magnets? A. Connect according to the winding of your coil. If your coil is of coarse wire, connect in parallel. If of the finer wire, connect in series. 3. How for heating wire? A. In parallel. 4. How for decomposing water? A. In series. 5. How for running motor? A. According to the resistance of the motor. 6. How for electro-plating? A. Three in series, the two series being arranged parallel. 7. How for incandescent light? A. This depends upon the resistance of the lamp. 8. How for arc light? A. The battery is too small for an arc lamp. 9. How for charging accumulator? A. Allow two in series for each accumulator. 10. How for operating induction coil? How for using spark coil? A. This depends upon the resistance of the primary coil. For coils as generally made connect as in No. 6. 11. What can I do to discourage the formation of crystals in the bottom of the battery jars? A. Use chromic acid or a solution in which bichromate of soda is used instead of bichromate of potash. 12. Are the crystals bichromate of potassium, and could I, therefore, use them in making new fluid? A. The crystals are chrome alum, of no value in a battery. 13. What is the difference in the principles applied in the construction of ammeters and voltmeters, so that when put successively in the same circuit, one will indicate its amperage, but the other its voltage? A. Ammeters have practically no resistance. They are placed directly in the main circuit. Voltmeters have very high resistance, and are arranged in a circuit parallel with the armature or the battery.

(1777) E. J. S. asks: 1. What "foot pounds," an electrical term, signifies. A. The "foot pound" is a unit of work or energy equal to the work required to raise one pound one foot high. 2 If I can get more light by using 70 volt lamps, or by using 40 volt lamps, with the eight light dynamo, and how many I can have in the circuit? A. You can get more light with the 70 volt lamps. You can run ten or twelve of them with the eight light dynamo, but its speed will have to be increased. 3. In winding the field and armature, are the number of pounds specified, for single or double covered magnet wire? A. Double covered. 4. What number and what kind of wire would you recommend me to use for wiring? A. This depends upon the length of your circuits. Probably No. 10 will do for the main conductors.

(1778) C. A. writes: 1. I use for a workshop a room which was formerly used to store salt meat, and part of floor and wall is saturated with brine, which has a great tendency to cause my tools to rust. Can you give a good and inexpensive remedy for this evil effect? A. Continual washing will tend to remove the salt from the wood. As a temporary relief keep a box of quicklime in your tool box. This will keep the air dry. 2. Can you give me a good receipt for a coating preparation for tools to prevent rust, one that is cheap and can be applied to tools without warming it or the tool, and adhere well and not feel sticky? A. Apply good varnish or alcoholic solution of shellac. The application should be made to the hot metal. 3. What coal is best for blacksmithing and what instructions can you give for selecting a good article? A. Coal with little sulphur or ash and not too rich in bituminous matter. Make a practical trial at the forge.

(1779) Queries asks for one or two books from which he can obtain some information and instruction about bird stuffing. A. We recommend Batty's "Taxidermy and Home Decoration," $1.50; Brown's "Practical Taxidermy," $2.50; "The Taxidermist's Manual," 50 cents.

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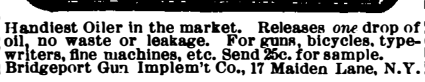

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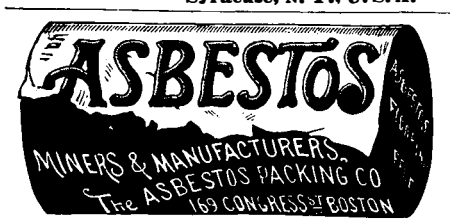

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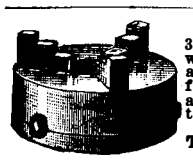

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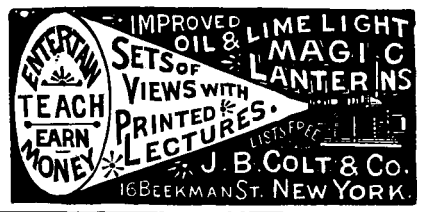
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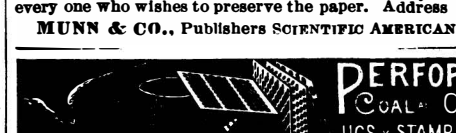

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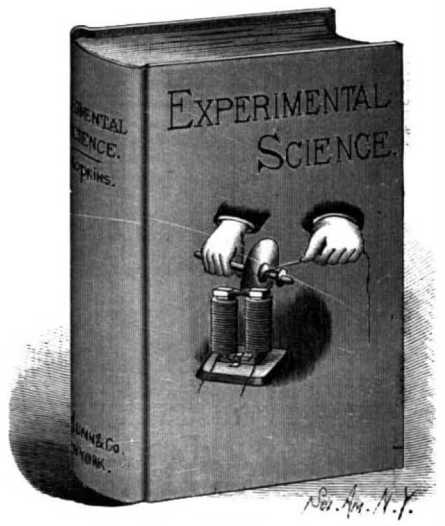

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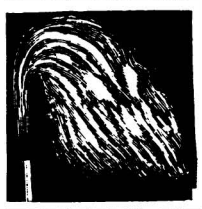

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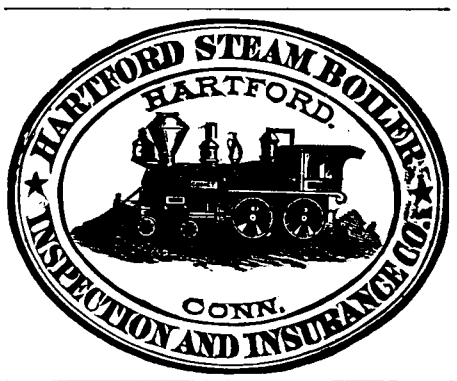

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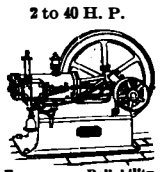

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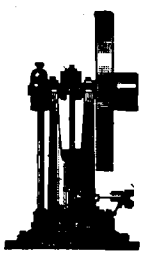

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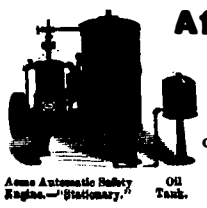

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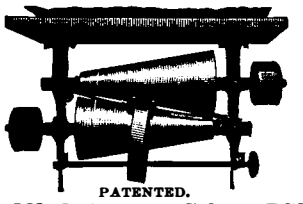

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